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Preliminary Report
on
BEDWELL RIVER AREA
Vancouver Island
British Columbia

by

H. SARGENT

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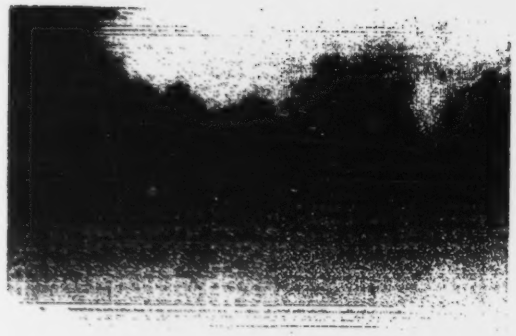

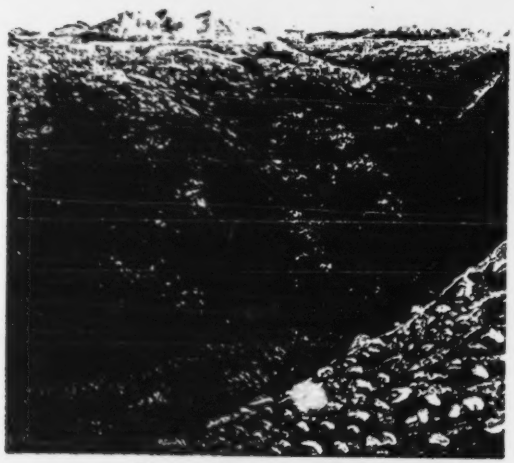

By courtesy of Department of Lands.

(1) Upper Bedwell Valley - Looking north-east from Ursus Mountain - Mt. Tom Taylor left of center.

By courtesy of Department of Lands.

(2) Basin of Noble Creek viewed from Ursus Mountain - Note dykes on ridge at right.

By courtesy of Department of Lands.

(3) Bedwell Valley from Cotter Mountain - Big Interior Mountain in center.

By courtesy of Department of Lands.

(4) Big Interior Mountain viewed from south-west.

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BEDWELL RIVER AREA

INTRODUCTION.

Location

The Bedwell River rises in the south-western part of Strathcona Park, and empties into the head of Bedwell Sound on the west coast of Vancouver Island. The name "Bear River" was frequently used in old reports and is still in common use. The head of Bedwell Sound is about 16 miles north of Tofino and Clayoquot which are ports of call about 35 miles north of the entrance to Barkley Sound. Most of the area tributary to the river is in the Clayoquot Mining Division, but the eastern part lies within the Alberni Mining Division.

History

Reports of the Minister of Mines, British Columbia, for 1898 and 1899, contain brief references to placer-mining in the 'sixties and to Chinese placer-miners abandoning the area in the late 'eighties, but give no information about the extent of the operations and the quantity of gold recovered. The Annual Reports for 1898 and following years refer to development work on gold-bearing veins and copper-bearing replacement deposits. Underground work was done on several properties. The claims forming the Seattle group were recorded in the years 1896, 1897 and 1899, and were brought to Crown-grant in 1907. The Annex and Belvidere claims were recorded in 1898 and 1903; after being Crown-granted in 1911, they were allowed to lapse but were again Crown-granted in 1929. Among other early locations on the lower Bedwell River, the Galena has been re-located under the same name, the present Avon group includes ground covered by the Castle group forty years ago, and the present Prosper group is believed to include ground known in 1903 as the Pakeha mineral claim.

The discovery of copper-bearing mineralization on Big Interior Mountain, on the divide between the Bedwell River and Drinkwater Creek (which flows into Great Central Lake), was mentioned in the Annual Report Minister of Mines, British Columbia, for 1903, but a later report indicates that the Big Interior group was located in 1899. Although situated at a high elevation in rugged country, about 12 miles from tidewater and partly covered by a glacier, this occurrence was considered to have attractive possibilities of developing into an important copper producer. Ptarmigan Mines Ltd., a

company with head office in London, England, acquired the claims Big I Nos. 5 and 6 and Great Central Nos. 5 and 6, known as the Ptarmigan group, lying north-west of the four claims of the Big Interior group. It was proposed to construct a road for about 13 miles from tidewater to a point which was to be connected, by an aerial tramway, with workings near the summit of the mountain. Road-construction had progressed to a point about 7 miles from tidewater, and equipment for the tramway was on the ground at the head of the Sound when operations were suspended on the outbreak of the war in 1914. The Annual Report, Minister of Mines, British Columbia, 1916, refers to a diamond-drilling program on the Big Interior group. Since that time there has been no reported activity at either property. The eight Crown-granted claims forming the two groups are still in good standing. The old reports, while referring to large exposures of low-grade copper-bearing material and to smaller occurrences of higher grade, do not indicate that development and testing had gone far enough to make dependable estimates of tonnage and grade possible.

The claims of the You group, covering a vein on the south-western slopes of Big Interior Mountain, were recorded in 1912. The property is mentioned for the first time in the Annual Report Minister of Mines, British Columbia, for 1913. Subsequent reports record development work at the property and the construction of a small mill. There was activity periodically at this property from 1912 until about 1933 or 1934 during which time there was but little activity elsewhere in the area. The You group, connected by trail with the road and trail designed to serve the Ptarmigan group, was reached also by trail from Great Central Lake via Drinkwater Creek, Della Lake, Bear Pass, and You Creek.

Although some claims were recorded from time to time there was but little interest in the Bedwell River area for some years preceding 1938. In that year prospectors visiting the area discovered gold-bearing veins, north-west of the river, on Noble (Clarke) Creek. This was followed by a discovery, south of the river, on Sam Craig Creek. Other discoveries were made in the autumn of the same year. A 70 per cent. interest in the Musketeer and Shamrock groups, on Sam Craig Creek, was optioned to Pioneer Gold Mines of B. C., Ltd., and Anglo-Huronian Ltd. Underground work was started on this property and development has been carried on continuously since 1938. In 1939 prospecting was carried out actively in the area and further discoveries were made. Substantial development was undertaken on the Musketeer-Shamrock, Buccaneer and Avon. By the end of the year about 550 claims had been

recorded covering discoveries as far inland as the north-western slopes of Big Interior Mountain, the head of You Creek, and upper Ursus Creek.

The surface showings and the initial development work indicated veins, of which the widths were usually measured in inches, containing sections which carry attractive if not spectacular values in gold. Practically all recent interest has been directed toward gold-bearing veins. Some of the recent stakings cover ground which had been staked previously and allowed to lapse, and on some of these properties former operators had done underground work without developing substantial bodies of ore.

Field Work and Acknowledgments

The writer spent from July 28th to September 15th, 1939, in the area, assisted by E. P. Williams and L. E. Rowebottom, mapping the geology of the area and examining prospects. A base camp situated about three miles from the head of Bedwell Sound was used for about half the season. For about two weeks the party stayed at the camp of Musketeer Mines, Limited, on Sam Craig Creek. During the remainder of the period short visits were paid to the upper Bedwell River where the Casino and You groups were examined, and to upper Ursus Creek where the Thunderbird and Trophy groups were examined. The current activity had its beginning so recently that prospecting and development were still in their early stages, and trails and living accommodation were quite limited. Prospectors and operating companies were generous in supplying information and assistance. The writer is particularly grateful to J. W. Harvey and Carl Noel, whose cabin and cooking facilities were used while the party was camped at 3-Mile and to F. A. Joubin, Manager of Musketeer Mines, through whose kindness the party was accommodated at the mine camp. The writer is also indebted to C. W. Sharp, Mining Recorder at Tofino, who kindly supplied information concerning the recording and ownership of claims.

General Character of the Area

In the lower 11 miles of its course the Bedwell River has an average gradient of about 80 feet per mile, the valley is of fair width though in several sections the river flows through rock-canyons. The sides of the main valley are steep and many of the tributary streams occupy hanging-valleys. Ursus Creek, the largest tributary, has an easy gradient from the forks to the mouth. Many of the tributary creeks rise in deep cirques and flow through steep-walled canyons. The sum-

mit of Big Interior Mountain has an elevation of 6,107 feet, the bottom of the Bedwell Valley, a little more than two miles to the west, has an elevation of 1,200 feet, the average slope is thus more than 2,000 feet per mile. Such slopes are common and locally there are numerous precipitous sections. A number of the mountains of volcanic rocks have jagged peaks, and many of the mountains and ridges of granitic rocks have rounded summits. On the other hand, many of the steepest escarpments, and the conspicuous jagged ridge on the top of Mount Tom Taylor, appear to be entirely of granitic rock. The area has a heavy annual rainfall with a comparatively short dry season in the summer. August of 1939 was favourable for field work, but wet weather set in on August 27th, and from then until field work was stopped there were few dry days. Rainfall subsequently raised the river level sufficiently to take out the 3-Mile pack-bridge which was more than 20 feet above the low-water level.

From elevations of 3,000 feet upward there is but little overburden or vegetation. The tops of the rounded ridges make easy travelling, and there are numerous small lakes in settings which are very pleasant in fine weather. Below 3,000 feet elevation, except on precipitous slopes of bare rock, there is generally a heavy growth of brush and conifers, with dense second-growth in burned sections. The lower flats have stands of timber consisting principally of hemlock and red cedar with some balsam. At higher elevations there is yellow cedar. Shakes of red cedar have furnished useful material for building cabins. The heavy vegetation makes travelling difficult, though on some of the steeper slopes it is only by hanging on to the brush that it is possible to climb up or down. The bottoms of the canyons are frequently filled with immense blocks of rock around or over which it is necessary to climb if the canyon is followed.

Access

During the summer months the Canadian Pacific Steamship Co.'s steamers maintain a service every fifth day on the west coast of Vancouver Island, and during the rest of the year a service every tenth day. The north-bound steamers call at Port Alberni about 24 hours after leaving Victoria, and leaving Port Alberni at night call at Tofino and Clayoquot about noon of the following day. South-bound the steamers reach Port Alberni from five or six to ten hours after leaving Tofino and Clayoquot, and reach Victoria about a day after leaving Port Alberni. Buses and trains from Victoria and Nanaimo make connections with the steamers at Port Alberni.

Canadian Airways Ltd., and Ginger Coote Airways Ltd., operate airplanes between Vancouver and Zeballos, which will call at Tofino when business offers, and also at the head of Bedwell Sound for an additional charge. The head of Bedwell Sound is about 20 miles by water-route from Clayoquot and Tofino. Since the current activity began, frequent service has been maintained between these points by gas-boats handling passengers and freight; small scows are available for handling heavier freight. The landing at the head of Bedwell Sound is on a slough, and cannot be used at low tide.

The old roads and trails were in a state of disrepair when the current activity began. The numerous bridges which had been built in 1913 and 1914 had been destroyed or were unsafe, and the corduroy in boggy sections of the road had deteriorated to the point where it would not stand up under pack-horse traffic. In 1939 a stringer-bridge for pack-horses was built at the 3-Mile crossing, and a suspension-bridge was built at the second crossing, a little less than 5 miles from tidewater. Construction of a truck-road was commenced in the autumn and the road was finished to a point approximately 2.9 miles from the head of the Sound. Since that time a truck has been in use over the completed part of the road. The route from Great Central Lake via Drinkwater Creek and Della Falls, to the You and to the Big Interior groups, has been used at various times. This route is now being used in connection with a prospect near Della Falls, but beyond that point has been used very little of late. It involves travelling to the head of Great Central Lake by gas-boat, thence by logging railroad for some miles and from that point by pack-trail to the foot of Della Falls.

References

Published information on the area consists chiefly of references in the Annual Reports, Minister of Mines, British Columbia, from 1898 to 1933, dealing with the mineral possibilities of the area and with particular properties. In Memoir 204, of the Geological Survey, Canada, published in 1937, M. F. Bancroft summarized information concerning some properties in the area, his source being principally the Annual Reports of the Minister of Mines, British Columbia. These publications, accordingly, contain no reference to more recent discoveries of great current interest. In 1928 the Geological Survey published "The Vancouver Sheet" on a scale of 8 miles to the inch, which shows the geology of Vancouver Island as then mapped. The following is an incomplete bibliography of reports dealing with Vancouver Island, and of some interest in interpreting the geology of the Bedwell River area.

1. Bancroft, M. F. - Gold-bearing Deposits on the West Coast of Vancouver Island - Geol. Surv., Canada, Memoir 204, 1937.

2. Clapp, Charles H. - Southern Vancouver Island - Geol. Surv., Canada, Memoir 13, 1912.

3. Clapp, Charles H. - Geology of the Victoria and Saanich Map-areas, Vancouver Island - Geol. Survey, Canada, Memoir 36, 1913.

4. Clapp, Charles H. and Cooke, H.C. - Sooke and Duncan Map-areas, Vancouver Island - Geol. Surv., Canada, Memoir 96, 1917.

5. Dolmage, V. - Quatsino Sound and Certain Mineral Deposits on the West Coast of Vancouver Island - Geol. Surv., Canada, Summary Report, 1918 part B.

6. Dolmage, V. - Barkley Sound, Vancouver Island - Geol. Surv., Canada, Summary Report, 1919 part B.

7. Dolmage, V. West Coast of Vancouver Island Between Barkley Sound and Quatsino Sound - Geol. Surv., Canada, Summary Report, 1920 part A.

8. Gunning, H. C. - Geology and Mineral Deposits of Quatsino-Nimpkish Area, Vancouver Island - Geol. Surv., Canada, Summary Report, 1929 part A.

9. Gunning, H. C. - Buttle Lake Map-area, Vancouver Island, Geol. Surv., Canada, Summary Report, 1930 part A.

10. Gunning, H. C. - Preliminary Report on the Nimpkish Lake Quadrangle, Vancouver Island - Geol. Surv., Canada, Summary Report, 1931 part A.

11. Gunning, H. C. - Zeballos River Area, Vancouver Island - Geol. Surv., Canada, Summary Report, 1932 part A-2.

12. MacKenzie, J. D.-Alberni Area, Vancouver Island, Geol. Surv., Canada, Summary Report, 1922 part A.

13. Stevenson, John S. - Lode Gold Deposits of the Zeballos Area, B. C. Department of Mines, 1938.

14. Young, G. A. and Uglow, W. L. - The Iron Ores of Canada, Vol. 1, B. C. and Yukon, Geol. Surv., Canada, Economic Geology Series No. 3, 1926.

In the following pages specific references to these publications are indicated by the numbers corresponding with the publications in the foregoing list.

Mapping

Figure 1 accompanying this bulletin gives the geology of the area as far as mapped in 1939 and indicates the position of a number of mining properties. So far as the writer knows no map showing the geology of the Bedwell River area has been published previously. Rock-exposures in the area, particularly at higher elevations, are good and there is sufficient contrast between the volcanic and granitic rocks, which underlie most of the area, for their distribution to be recognized readily, even from a distance in most cases. In general the distribution of these types has been recognized by engineers and keen prospectors, some of whom have prepared their own maps.

Geological mapping undertaken in the Bedwell River area in 1939 is incomplete and does not extend as far as the boundary of any previously mapped area. The south-western limit of mapping, however, is not far from the mapping of the coast represented on the Vancouver Sheet (Geological Survey, 1928); and the southern limit of the Buttle Lake area (9) lies about 2 miles north of the eastern end of mapping in the Bedwell area. A written description by M. F. Bancroft (1) gives information concerning the rocks lying north of the western part of the area and, combined with Gunning's Buttle Lake map and notes, makes it possible to place within narrow limits the main contact on Moyeha River, north of the Bedwell River area.

A topographical sheet, Bedwell Sheet (north half), Map No. 92 F/5, to a scale of 2 inches to the mile, released by the British Columbia Department of Lands in 1939, includes a large part of the Bedwell River Area. The topography is indicated by 100-foot contours. The southern boundary of the map is an irregular line from a quarter of a mile to about a mile south of the southern boundary of Strathcona Park. For the purpose of the present preliminary report the geology is indicated on Fig. 1 which shows the drainage-pattern, location of the road and trails and of a number of prospects. The positions and elevations of triangulation stations used by the topographic survey are shown, and the elevations of summits or the highest contours of mountain peaks are also indicated. The topographic features were copied so far as possible from Map No. 92 F/5. South of the limits of this sheet the writer mapped the drainage-pattern with the aid of airplane photographs borrowed from the Department of Lands. Control for extension to the south was rather loose and there will doubtless be inaccuracies at higher elevations arising from the fact that the scales of the photographs

change with elevation. Locations of mining properties, with the exception of Crown-granted claims shown on Map No. 92 F/5 are by the writer.

GENERAL GEOLOGY.

Distribution of Rock-Types

The parts of the area mapped in 1939 are underlain by volcanic rocks of the Vancouver group, some lenses of recrystallized limestone associated with the Vancouver group, and by granitic rocks associated with the Coast Range Intrusion. The limestone lenses are too small to be represented on the accompanying map (Fig. 1). The writer believes that except for a granitic intrusive extending north-west from the basin of Penny Creek the whole western part of the map-area is underlain by members of the Vancouver group, and that the rocks of the Vancouver group also underlie most of the southern part of the area.

Granitic intrusives in the map-area are represented by two large masses, the smaller, possibly a tongue, extends from the Penny Creek Basin to the unmapped area to the north-west and will be referred to as the Penny Creek intrusive. The larger mass will be referred to as the Bedwell River batholith. Its western margin trends southerly to south-easterly on the eastern sides of Mariner and Ursus Mountains, and then turns to a more easterly direction crossing Ursus Creek near the forks. This mass extends to the north and is doubtless continuous with the mass mapped by Gunning in the south-western part of the Buttle Lake Area. The south-western part of Big Interior Mountain is at least partly of hornblende-quartz-diorite, which is conspicuously darker than the normal rock of the Bedwell River batholith, and from the distance might be mistaken for volcanic rock.

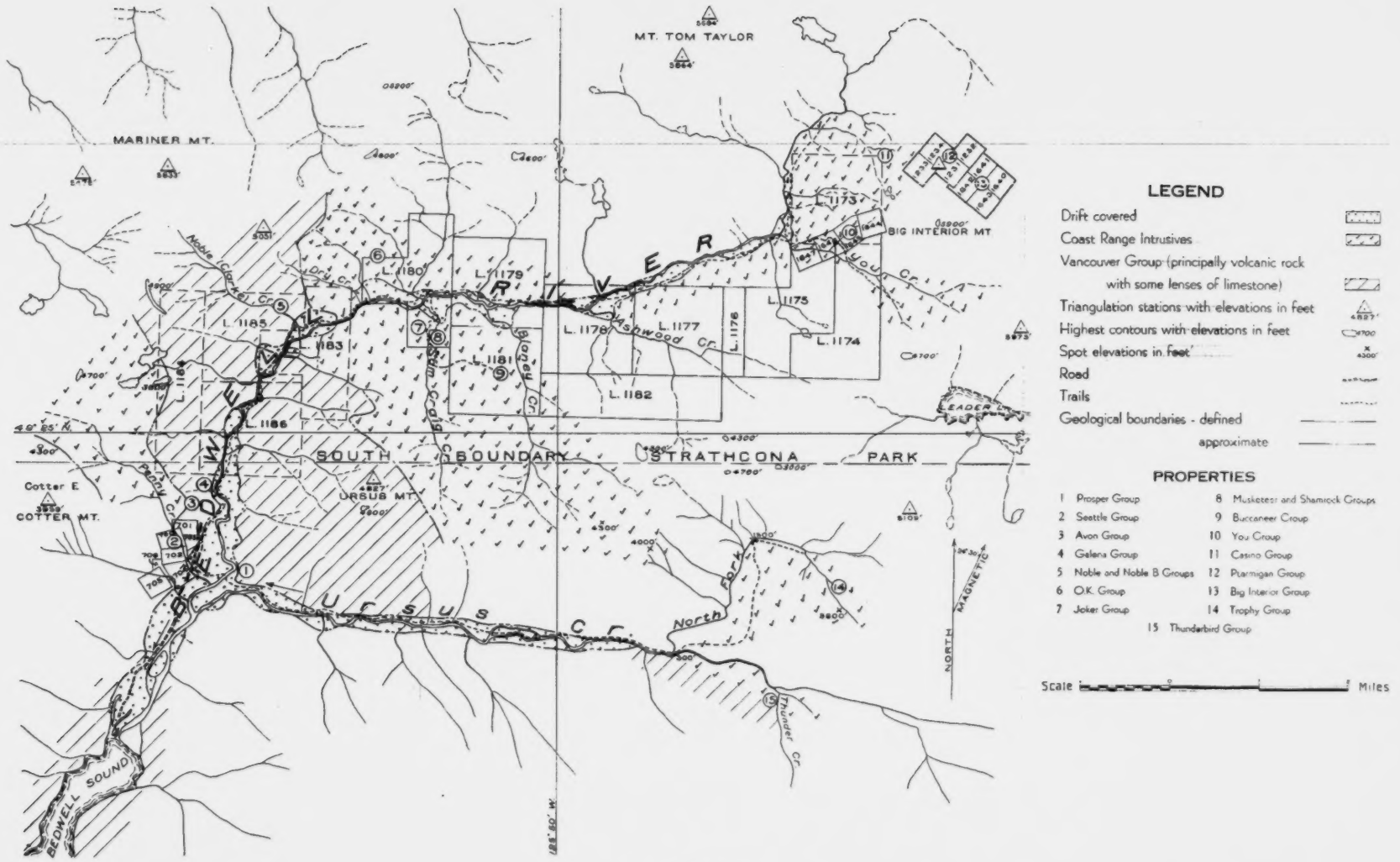
The southern and eastern boundaries of the map were not reached in 1939. It seems probable that the granitic rocks extend to the south-east beyond the boundaries of Fig. 1. Gunning's Buttle Lake map coupled with the fact that the limestone is known to outcrop on the summit of Big Interior Mountain suggests that the north-eastern part of the area on Fig. 1 is occupied by non-granitic rocks. The Bedwell River batholith thus has a width of more than six miles in this area. Gunning says that in the southern part of the Buttle Lake area it is at least ten miles wide. Insufficient work was done in the eastern part of the Bedwell River area to determine whether or not there are some roof-pendants within the area occupied by the batholith, but some evidence obtained in the field

points to the existence of one or more roof-pendants or to a change in the character of the intrusive.

Vancouver Group

The rocks of this series were not studied in detail by the writer. They have been described in considerable detail in their occurrence in southern Vancouver Island by Clapp (2, 3 and 4), and in less detail in their occurrence in northern Vancouver Island by Gunning (8, 9 and 11), and by other writers. This group consists of an assemblage of volcanic rocks with interbedded tuffaceous, argillaceous and quartzitic sediments and limestone, and has been assigned to the Triassic and Jurassic (?) periods. Bancroft (1) referred to fossil beds on the Moyeha River (north of Bedwell River Area) approximately 20 miles from the west coast of Flores Island. West of these beds he described, -- "a great thickness of amygdaloidal basalt forming high, ragged summits on both sides of the valley."--This would be north-west of Mariner Mountain and probably continuous with the thick series of volcanic rocks exposed on Mariner and Ursus Mountains in the Bedwell River area. Bancroft also refers (1 page 11) to limestone beds outcropping at the head of Cotter Creek, which would be west of triangulation station "Cotter E" near the western boundary of Fig. 1 accompanying this bulletin. Dolmage (7 page 15 A) refers to thin beds of limestone on Bedwell Sound and Herbert Arm.

The volcanic rocks, observed by the writer in the Bedwell River area, consist chiefly of rather fine-grained andesites, and black or dark-green basalts including amygdaloidal varieties with light-green amygdules standing out on the weathered surfaces. Float of volcanic breccia was found in the Bedwell River, but this rock was not observed in place. With the volcanics are included andesitic and basaltic dykes, resembling the normal volcanics, often difficult to distinguish from them and believed to be closely associated in origin with the volcanics. Some rocks observed on Mariner Mountain are probably greatly altered tuffs. In general the rocks of the Vancouver group are massive, fine-grained and so altered that the structure is obscured. Seen from a distance these rocks are of a very dark-brown colour, in marked contrast with the light colour which characterizes the surface exposures of the Coast Range intrusives. Near contacts with Coast Range intrusives, the volcanics are cut by andesite, aplite, dacite and basalt dykes, and by some dykes believed to be andesites but now so altered that the primary minerals cannot be determined. These dykes are undoubtedly related to the larger intrusives.



LEGEND

- Drift covered
- Coast Range Intrusives
- Vancouver Group (principally volcanic rock with some lenses of limestone)
- Triangulation stations with elevations in feet
- Highest contours with elevations in feet
- Spot elevations in feet
- Road
- Trails
- Geological boundaries - defined
- approximate

PROPERTIES

1. Prosper Group
2. Seattle Group
3. Avon Group
4. Galena Group
5. Noble and Noble B Groups
6. O.K. Group
7. Joker Group
8. Musketeer and Shamrock Groups
9. Buccaneer Group
10. You Group
11. Casino Group
12. Ptarmigan Group
13. Big Interior Group
14. Trophy Group
15. Thunderbird Group

Scale 0 1 2 Miles

Fig. 1. Bedwell River Area.

Intercalated with the Vancouver volcanics, in southern Vancouver Island, Clapp (2) found lenses of limestone and marble to which he gave the name Sutton series. He believed that the limestone lenses in general were conformable with the volcanics. Gunning (8, 10 and 11) mapped extensive areas of Triassic limestone, as Quatsino formation, in several areas in the northern half of Vancouver Island and subdivided the Vancouver group into three parts, the limestone and the parts lying below and above it. In the Buttle Lake area (9), mapped by Gunning on a scale of eight miles to the inch, Palaeozoic limestone was found underlying the Vancouver group. Gunning suggests that limestone known to occur near the summit of Big Interior Mountain may be the continuation of the Palaeozoic limestone recognized in the Buttle Lake area.

Small limestone lenses on the Seattle and Avon, near Penny Creek on the west side of lower Bedwell River, are doubtless properly included in the Vancouver group. On the Avon the limestone was seen in contact with granitic rock only, but volcanic rocks outcrop nearby. On the Seattle the limestone was seen in contact with volcanic rocks only. All the occurrences are near the Penny Creek intrusive and the limestone is more or less metamorphosed. It is, apparently, quite pure and where least changed consists of white recrystallized material containing small stringers or lenses of green silicate minerals. Some of the limestone is partly replaced by iron, copper and zinc sulphides and magnetite, and some is almost completely replaced by magnetite, pyrite and chalcopyrite. At some points, east of Penny Creek, on the Seattle, rock composed of garnet, epidote, and magnetite, with a minor quantity of sulphides, probably represents completely-replaced limestone. At one point such rock lies between recrystallized limestone partly replaced by magnetite, pyrite, chalcopyrite and sphalerite on the one side and on the other, fine-grained volcanic rock, which contains a green fibrous mineral, probably actinolite, along joints. The metamorphic rock appears to grade into the fine-grained volcanic and may replace it in part.

On the Seattle group about 200 feet west of Penny Creek, there is one of the wider exposures of limestone, the full width of which is not exposed. A little pyrrhotite replaces the limestone at one point. At a point on the western bank of the creek, limestone is exposed containing a little magnetite along the sheared contact with andesitic volcanics. A three-foot aplite dyke outcropping nearby in the creek also contains a little magnetite. On a small ridge east of Penny Creek, also on the Seattle group, there are other exposures of limestone of which the observed widths did not exceed 7 or

8 feet. On the Avon group, northerly from these occurrences, limestone has a maximum observed width of 80 feet. Further references to mineralized limestone appear later in this bulletin under "Replacement Deposits."

Coast Range Intrusives

In southern Vancouver Island, Clapp (2, 3 and 4) mapped various bodies of intrusive igneous rock which he regarded as all belonging to one general period of intrusion. He says -- "which is correlated with the irruption of the Upper Jurassic Coast Range batholith"-- (3 page 14). Minor intrusives later than the main batholiths were regarded as possibly extending into the Lower Cretaceous period. The Beale diorite and Saanich granodiorite and quartz-diorite, the most widespread types in the northern and western parts of southern Vancouver Island, were regarded as closely related to each other and also to the gneissic intrusives near the south end of the Island. In Northern Vancouver Island Gunning (8, 9, 10 and 11) mapped rocks of the same general types, as "Coast Range Intrusives," and assigned them to the Jurrassic and/or Cretaceous periods. The granitic intrusives in the Bedwell River area are doubtless of the same age and related to the Coast Range Intrusion.

In the Bedwell River area the most widespread varieties of granitic rock are light-coloured and often weather to a chalky-white. They show considerable differences in texture, but in general have feldspar grains not more than 2 or 3 millimeters across. The quartz ranges from small interstitial grains to phenocrysts which may be 7 or 8 millimeters across. The average rock of the Bedwell River batholith is quartz-diorite with quartz forming from 15 per cent. to 30 per cent. of the whole. The feldspars consist chiefly of oligoclase-andesine, the principal constituent of the rock; alkali-feldspar, orthoclase and microcline, rarely forms as much as one-third of the total feldspar. The proportion of alkali-feldspar is higher in the Penny Creek intrusive than in the Bedwell River batholith to the east. The Penny Creek intrusive is richer in orthoclase and approaches the composition of granodiorite in which, according to the classification used, the ratio of alkali-feldspar to soda-lime-feldspar is not less than three to five. The femic minerals are usually altered, hornblende is recognized in elongated laths and there is some biotite. Chlorite is found, apparently replacing biotite and hornblende, and with epidote and sericite replacing feldspar. Tiny grains of apatite are found usually as inclusions in the quartz grains, but in sections from some parts of the area apatite crystals are present as inclusions

in feldspar. Normally, the rock has a pale-green cast, due to the altered femic minerals, but in some sections the surfaces are brown with iron oxide.

The rock is jointed and at several points is cut by shears which to a degree are reflected in the topography. Near the shears the rock is usually much altered; sericite, kaolin, carbonate minerals and chlorite replace the primary minerals, sometimes with the almost complete destruction of the original rock-texture; the colour too may become a darker green with the increase in the chlorite.

Rather fine-grained diorite which outcrops at some points on the margin may be older than the quartz-diorite which forms the main mass of the Penny Creek intrusive. Thin sections from two points consist essentially of oligoclase with abundant hornblende and some orthoclase. One section contained a little quartz and the other some titanite; both were altered, the feldspars and the hornblendes being attacked by a carbonate mineral.

As indicated earlier in this bulletin little time was available for study of the rock distribution in the eastern half of the area. Intrusive rock, darker than the prevailing types to the west, occurs east of You Creek, toward the south-western part of Big Interior Mountain. Fine-grained diorite, similar to that occurring near the eastern contact of the Penny Creek intrusive, was found in You Creek, just south of the You group, and for some distance on the western side of the creek. This suggests the possibility of roof-pendants existing in that locality. Extending easterly from a small lake, north of the north fork of Ursus Creek, just south of the park Boundary, the rock, from a distance, appeared darker than the normal quartz-diorite, and may be related to the dark intrusive of Big Interior Mountain.

The dark intrusive, exposed at the head of You Creek and on the east side, forming in part the south-western end of Big Interior Mountain, is a medium-grained granitic rock containing about 15 per cent. of dark minerals. A section studied microscopically contains about 10 per cent. quartz, and roughly 75 per cent. oligoclase partly replaced by sericite. The dark minerals are hornblende, epidote, chlorite and magnetite. Magnetite occurs as small isolated grains usually surrounded by rims of chlorite. It also occurs with epidote, in partly-altered hornblende grains, or surrounded by areas of chlorite. To distinguish it from the light-coloured intrusive this rock may be called hornblende-quartz-diorite. The contact between this rock and the underlying light quartz-rich quartz-diorite

is readily visible on the slopes of Big Interior Mountain above You Creek. This contact is inclined steeply to the south on the side of the mountain and appears to strike a little east of north. The hornblende-quartz-diorite is cut by numerous steeply-dipping andesite dykes, similar to dykes found in the normal phase of the batholith west of You Creek and elsewhere.

The margins of the Bedwell River batholith and the Penny Creek intrusive are irregular in detail; dykes and irregular masses extend into the invaded volcanic rocks. The southern end of the Penny Creek intrusive probably consists of several finger-like tongues and dykes. There is a good deal of overburden here, which with the complex relationship between the intrusive and the invaded rock made it impossible to delimit the boundaries in the time devoted to that part of the area. The western contact of the Bedwell River batholith, exposed in Dry Creek north of the Bedwell River, is also irregular. Several large masses of granitic rock invade the volcanics close to the main contact, and numerous light-coloured dykes extend for half a mile from the contact. These dykes stand out conspicuously against the darker volcanics on the spur of Mariner Mountain which forms the eastern wall of the basin of Noble (Clarke) Creek. The presence of some isolated masses of volcanic rock, within the boundaries of the batholith, suggests that erosion has not proceeded deeply into it. Changes in texture of the granitic rock are probably features developed near the margins while the intrusive was still in the viscous stage and, if so, support the notion that erosion has not completely removed the outer shell of the intrusive. The most obvious change in the primary nature of the intrusives is from a rock of medium, uniform-sized, grains to a porphyritic phase with quartz phenocrysts, about 1/4 of an inch across, which are particularly noticeable on weathered surfaces. In general, the texture of the main intrusives and of the most closely related dykes which also have granitic texture, does not change markedly as the contacts are approached. The granitic texture is preserved and contacts, where exposed, are sharp even if they are irregular in detail.

On the northern side of Dry Creek a sill-like mass of porphyritic, fine-grained, quartz-diorite about 175 feet thick has a sharp contact with the underlying amygdaloidal basalt. The usual medium-grained light-coloured quartz-diorite of the batholith overlies the sill; the contact was covered with overburden. This contact also must be sharp as the texture of the sill is essentially uniform from its lower contact to the highest point where it was observed, and the batholith, 5 feet higher, has a much coarser normal texture than the sill. The

similarity of the sill, to wide dykes found well within the main batholith, suggests that the sill may be younger than the batholith. The volcanics below, and the lower part of the sill, are cut by narrow quartz veins and impregnated with fine disseminated grains of pyrrhotite and chalcopyrite. In bluffs on the eastern side of the creek, north-westerly from the point where the sill is exposed, the lowest exposure consists of granitic gneiss, cut by feldspar-porphyry dykes, above which the normal quartz-diorite of the batholith is exposed. The gneiss and feldspar-porphyry dykes are cut by a stock-work of narrow quartz veins, and disseminated pyrrhotite-chalcopyrite mineralization occurs in the veins and wall-rock. Some molybdenite occurs in narrow fractures.

Dykes of andesite, dacite, feldspar-porphyry and hornblende-feldspar-porphyry are found both in the Bedwell River batholith and in the Penny Creek intrusives, and also in the volcanic rocks. Dykes, which range from granite-aplite to diorite, are found in the invaded rocks near the contacts with the batholith and the intrusive rocks. Masses of fine-grained quartz-diorite and feldspar-porphyry are found at the margins of the batholith and well within the batholith. A peridotite dyke about 75 feet wide, in the batholith, outcrops on Sam Craig Creek about 1 2/3 miles south of its confluence with Bedwell River.

ECONOMIC GEOLOGY.

Introduction

In the following pages of this bulletin general observations are offered concerning veins, replacement deposits, and placer-mining, in the Bedwell River area. These general notes are followed by descriptions of mineral deposits occurring on the various properties. The approximate position of each property is indicated by a reference number on Fig. 1, and this number is given after the property name in these notes. In most cases the writer was guided to particular deposits by registered owners or agents of owners, and depended on the guides for information concerning the ownership of the ground. The names of claims and of their recorded owners and the dates of recording were verified from information supplied by the Mining Recorder. The country is rugged and much of it is covered with heavy growth of trees or brush. Very few of the recently-staked claims had been surveyed even roughly, and no attempt had been made to mark the boundaries on the ground. For these reasons it was impracticable in most cases to check the relationship of deposits with the boundaries of the claims on which they were reported to occur. Therefore, it

should be borne in mind that statements, that deposits occur on certain claims, are subject to revision when accurate surveys have been made.

Current interest in the area is principally in gold-bearing veins. Many samples were taken to obtain information of the range of values and on the association of values with different types of mineralization. The samples were not closely enough spaced to permit accurate estimates of average values.

Veins

In the Bedwell River area numerous fractures occupied by veins occur in the areas of granitic rocks in the volcanic rocks, and in dykes in either. The vein-mineralization, usually less than 1 foot wide, consists of quartz with some carbonate gangue, and more or less sulphide mineralization. Some of the veins carry values in gold often accompanied by silver which is relatively unimportant. The base-metal sulphides which include chalcopyrite, galena, pyrite, pyrrhotite, and sphalerite, cannot be expected to contribute appreciably to the value of the veins. The economic value of these deposits accordingly depends on the gold which they contain.

Vein-mineralization occurs filling fissures and as lenses and stringers in shears and sheeted zones. In filled-fissures there is usually some gouge at the walls but introduced vein-matter is the major part of the vein-filling. The shears are up to 2 or 3 feet wide and contain crushed and altered wall-rock; sheeted zones, consisting of closely-spaced fractures separated by altered wall-rock, may be several feet wide. In the shears and sheeted zones, lenses of vein-matter up to a foot wide occur locally; elsewhere narrow stringers may occur. A section of the Musketeer vein consists of a shear, reaching a maximum width of about 30 inches, with narrow stringers near the walls. At both ends of this section the vein consists of a fissure, with some gouge along the walls, containing vein-matter which has a maximum width of about 8 inches.

So far as is known at present the gold values are essentially limited to the introduced vein-matter and are not found in the altered wall-rock. Some veins containing very small percentages of sulphides give good assays in gold, and in other veins the gold values in moderately well-mineralized parts may be comparable with values in heavily-mineralized parts; but in general it appears that vein-matter moderately well-mineralized with sulphides is more apt to carry gold

values than is vein-matter which is poor in sulphides.

Quartz is the most abundant gangue-mineral. It often consists of a rather loose aggregate of crystals, some of which are an inch long. White carbonate gangue, chiefly calcite, occurs in small quantity and there is some iron-bearing carbonate. Veins developed in the shears in the volcanic rocks contain chloritic remnants of wall-rock, some chlorite also occurs in the veins in the granitic rocks. Parts of many veins are banded or ribboned by fractures, in the vein-matter, parallel with the vein-walls. Some of the fractures contain thin partings of gouge, others have been healed by later mineralization. Other parts of the same veins may show no banding.

Sulphide minerals in varying quantity are present in most of the veins. They rarely average more than a small part of the vein-matter, but locally they may form as much as 50 per cent. of it. They occur grown around quartz crystals, and filling fractures in the gangue and in earlier sulphides. Frequently some sulphide mineralization is developed along the banding of ribboned veins. Pyrite is often in well-formed crystals some of which are 1/2 an inch long. It is the most widespread and usually the most abundant sulphide. Chalcopyrite is found in small quantity in most of the veins; it seems to be more abundant in veins in the volcanics than in veins in the granitic rocks. Sphalerite, with which some chalcopyrite is often closely associated, and galena, occur in many of the veins, and locally may form an important part of the vein-filling. They appear to be more abundant in veins in the granitic rocks than in veins in the volcanics. Pyrrhotite and marcasite, derived from it, were found in veins in the Noble and Noble B groups. Arsenopyrite was found in a vein in quartz-diorite on the Casino group. Covellite seen in several veins was probably derived from chalcopyrite.

Polished sections of specimens from the veins in granitic and volcanic rocks, from various parts of the area, were studied microscopically. Most of the sections came from veins in the Bedwell River batholith near Sam Craig Creek. The sections studied are of vein-matter well-mineralized with sulphides. Pyrrhotite surrounded by chalcopyrite was found in a section from the You vein which also contains pyrite; but elsewhere pyrite and pyrrhotite were not found in the same vein. The microscopic study indicated that chalcopyrite, sphalerite and galena are later than the pyrite, and that galena and probably some chalcopyrite are later than the sphalerite. Gold, found in most of the sections, appeared to be about as late as the latest sulphides. The relationships of gold and of the various sulphides are discussed in more de-

tail in notes on properties, particularly in the report on the Musketeer and Shamrock groups.

Veins in the area have a large range in attitude. Those within the Bedwell River batholith, near Sam Craig Creek, may be divided into two groups with attitudes noted:-

I. Strike, from 10 to 30 degrees east of north;
Dip, from 85 degrees westward to 80 degrees eastward.

II. Strike, from north-east to about due east;
Dip, from 45 to 75 degrees north-westward or northward.

Outside the limited area mentioned the veins are found in more diverse attitudes.

Replacement Deposits

Limestone lenses more or less replaced by silicates and metallic minerals, near the Penny Creek intrusive have already been mentioned. At one point on the Avon group, limestone, found in contact with granitic rocks, is partly replaced by disseminated grains of pyrite, chalcopyrite and magnetite. At another point the metallic minerals have almost completely replaced the limestone. Elsewhere on this property green silicates with some magnetite are found in the limestone at and near the contacts; the main mass of the limestone, however, contains but little introduced material. On the Seattle group, andradite garnet, epidote and magnetite with more or less pyrite and chalcopyrite completely replace limestone and possibly some volcanic rock, and at one point disseminated mineralization consisting of magnetite, pyrite, chalcopyrite and sphalerite was observed in the limestone. On the Galena group magnetite, pyrite and chalcopyrite replace fine-grained volcanic rock. On the trail, a little more than a mile north-easterly from the bridge at 3-mile, there is an exposure of chalcopyrite filling joints and to some extent replacing the volcanics in the walls of the joints. This occurrence was described under "Empress" in the Annual Reports, Minister of Mines, British Columbia, 1917 and 1918, at which time the surface was stripped. The information available indicates that the gold content at these occurrences is low. The copper content is variable; some of the material is rich in copper. The work done on the occurrences referred to, has not developed commercial ore-bodies. The copper-bearing deposits on Big Interior Mountain were not visited by the writer. From descriptions in several Annual Reports, Minister of Mines, British Columbia, it appears that they are replacement

deposits and that at least some of the mineralization may carry moderate values in gold.

Bancroft (1), refers to a magnetite deposit reported to have been found on the divide between the first important tributary of the Moyeha River and the Bedwell River. This seems to be near the head of Penny Creek. Magnetite occurs in deposits on lower Penny Creek but the grade would not meet commercial specifications. However, there may be magnetite deposits, of commercial interest, replacing limestone in the area.

Earlier in this bulletin reference was made to a stockwork of quartz veins close to the contact in Dry Creek north of the Bedwell River. Disseminated pyrrhotite-chalcopyrite mineralization occurs in the veins and partly replaces the wall-rocks. The Crown-granted claims Belvidere and Annex (not shown on Fig. 1) are understood to cover this occurrence. It is reported that sampling of some of the veins indicated moderate values in gold. The boundaries of the claims were unknown to the writer. As no guide was available, the deposit was not examined in detail and is not described in this bulletin.

Placer-Mining

Early reports on the Bedwell River area refer to placer-mining. The scenes of principal activity are believed to have been on the north-western side of the river about five miles from the mouth, and just above a canyon-section of which the up-stream end is about 6 1/2 miles from the mouth. In the spring of 1939 an effort was made to recover gold from the river gravel below the lowest canyon-section approximately 3 miles from the mouth of the river. From this point to the mouth, the river-bed is wide, bed-rock exposures are known to the writer at one point only, and there are extensive flats principally on the north-western side of the river. The placer operation attempted in the spring of 1939 was on ground understood to be included in the Agnes placer-claim registered in the name of J. W. Lamb. Two wing-dams were constructed and it is reported that some gold was recovered before high water made it necessary to cease operations. Some test pits were sunk a few feet on the flat west of the river, near the wing-dams. It is reported that gold was recovered at the wing-dams, in the test pits, and from testing and panning along the river. So far as the writer knows, testing has not been sufficiently extensive to determine the nature of the gravel, depth to bed-rock, or average values. Gold recovered in testing is reported to be rather fine, but not flour gold. Large boulders such as might be expected in a country of such rugged

topography were not seen in the river-channel by the writer. Four placer-leases, extending down-stream for a total distance of approximately 2 miles from the Agnes claim, were granted on January 23rd, 1940, to Frank A. Noel (Lease 143), W. A. Noel (Lease 144), H. Noel (Lease 145) and Carl Noel (Lease 146).

NOTES ON PROPERTIES AND MINERAL DEPOSITS.

PROSPER GROUP. (No.1 - Fig.1) The claims Prosper Nos. 1 to 8 covering ground between Bedwell River and Ursus Creek were recorded in December 1938, February 1939 and March 1939. The registered owners are, C. A. Elkington, K. Elkington, R. Erickson, Anthony Guppy, Ethel W. Guppy, Walter Guppy, Anton Hillebrand and Anton Knes. Shallow cuts and stripping have been made exposing a vein extending easterly from the portal of an old adit and north-easterly from the adit there are some old cuts on another vein. It is reported that the old workings were made about 1903 when the ground was held under the name Pakeha.

North-easterly from the confluence of Ursus Creek with Bedwell River the ground is relatively flat for about half a mile, then it begins to rise steeply at the end of a rocky spur which extends south-westerly from Ursus Mountain, between the two streams. A small cabin has been built at the south-eastern side of Bedwell River near a sharp bend. The cabin is reached by a rough trail, about half a mile long, which leaves the main trail at the eastern side of Penny Creek. The Bedwell River, a wide stream near the cabin, is crossed on a foot-log. The portal of the old adit, at approximately 325 feet elevation, is roughly a tenth of a mile easterly from the cabin and approximately 260 feet higher than the river-level at the cabin.

The rocks exposed near the workings are fine-grained volcanics of the Vancouver group. It is probable that the volcanics are intruded by dykes associated with the Penny Creek intrusive which lies to the north-west across Bedwell River. The adit and surface workings extending easterly from it expose fracturing which strikes about north 70 degrees east and dips 65 to 70 degrees northward. Some branch-fractures, striking north-easterly and dipping north-westward, run into the hanging-wall. There has been shearing along the main fracture and chloritic remnants of wall-rock appear in lenticular masses of quartz developed in the shear. At some points quartz stringers and disseminated grains of pyrite are developed in sheared altered wall-rock. Usually the shearing

is confined to widths not exceeding 18 inches, but at some points this width is greater. Some of the quartz is moderately well mineralized with pyrite and chalcopyrite. A little free gold was seen in honey-combed vein-matter from the outcrop.

In the adit, quartz from 1 inch to 5 inches wide containing a little sulphide mineralization occurs along shearing at the foot-wall, branch-fractures extend north-easterly to a slip parallel with the footwall-slip and 2 or 3 feet from it. In a line easterly from the adit-portal, surface cuts, pits or strippings have been made at 12 points, the farthest is 420 feet easterly from, and about 200 feet higher than, the adit. The first two cuts above the portal expose poorly-mineralized vein-matter. Pits 1 foot to 4 feet deep, 115 feet and 135 feet from the portal, do not expose bed-rock. The next cut exposes 6 inches of quartz with some chlorite but little sulphide mineralization. In the next cut, about 200 feet from the portal, quartz 16 inches wide is fairly well mineralized for 3 or 4 inches from the hanging-wall. The next two cuts expose irregular masses of quartz from 3 to 12 inches wide. The next, about 300 feet from the adit-portal, exposes well-mineralized quartz 7 to 9 inches wide at the hanging-wall separated by a narrow horse from 7 inches of quartz at the foot-wall. At about 345 feet from the portal, quartz 6 to 10 inches wide is exposed in a vertical face, and is narrowest at the top. The quartz is ribboned and contains some chalcopyrite. Sheared wall-rock is replaced irregularly by quartz and white carbonate for 8 to 14 inches to the hanging-wall and for 20 to 24 inches to the foot-wall. Mineralization, consisting principally of the replacement-material, is exposed to a point about 375 feet from the portal, narrowing as it is followed easterly. At 380 feet from the portal a fault with shearing 20 inches wide, strike north 60 degrees east and dip 80 degrees north-westward, crosses the continuation of the replacement-material. A cut extending 8 or 10 feet easterly from the fault exposes replacement-material with some vein-quartz over a total width of 10 to 15 inches. The last cut, 25 feet north-easterly, exposes a lens of quartz and carbonate with some chlorite. The lens, up to 7 inches wide, is in a fracture which strikes north 40 degrees east and dips 85 degrees north-westward.

The following samples were taken from this series of cuts, between 200 and 390 feet from the adit-portal.

Sample Number	Distance from adit portal feet	Width inches	Description	Assay	
				Gold oz. per ton	Silver oz. per ton
1	200	16	Quartz, well-mineralized with sulphides for 3 or 4 inches from hanging-wall.	0.66	1.6
2	275	5	Quartz, little sulphide mineralization.	0.14	Trace
3		9	Quartz, well-mineralized for 3 1/2 inches from hanging-wall. At hangingwall-side of horse.	0.44	1.8
4	300	6	Horse of wall-rock.	0.02	Trace
5		7	Foot-wall-quartz, some sulphides.	0.84	0.8
6		11	Replacement-material in hanging-wall.	Trace	Trace
7	345	7	Central quartz, some chalcopyrite.	0.80	0.2
8		20	Replacement-material in foot-wall.	Trace	Trace

Sample Number	Distance from adit portal feet	Width Inches	Description	Assay	
				Gold oz. per ton	Silver oz. per ton
9	390	14	Principally replacement-material, 8 feet easterly from fault.	Trace	Trace

NOTE: Sample No. 1 contained 1 per cent. copper and sample No. 3 contained 0.7 per cent, the copper content of the other samples was negligible.

About 250 feet north 50 degrees east from the adit-portal there is an old cut at approximately 440 feet elevation. It exposes quartz with some carbonate, chlorite and a little chalcopyrite in a fracture which strikes about north 60 degrees east and dips 65 degrees north-westward. A sample across the 20-inch width assayed: Gold, 0.26 oz. per ton; silver, 0.8 oz. per ton. Approximately 40 feet westerly and the same distance lower in elevation, another cut exposes the vein which here consists of 8 inches of quartz separated by a "horse" 8 inches wide from quartz 3 to 5 inches wide. The quartz contains a little chalcopyrite.

SEATTLE GROUP. (No.2 - Fig.1)

This property consists of 7 Crown-granted claims, Seattle, Lot 700; Brooklyn, Lot 701; Omaha, Lot 702; New York, Lot 703; Tacoma, Lot 704; Grey Mule, Lot 705; and Rebecca, Lot 706; situated on Penny Creek on the north-western side of the Bedwell River. The claims were staked in 1896 and 1898 and are therefore among the oldest locations in the area. They were Crown-granted in 1907 but later reverted to the Crown, and were again Crown-granted in 1928. The registered owners are William Lyon McIntosh and Douglas G. W. Aimer of Victoria.

Early work on the property was directed principally toward the discovery and exploration of copper-bearing replacement deposits, but some interest was also shown in quartz veins. References to the earlier work on the property appear in the Annual Reports, Minister of Mines, British Columbia, for 1898, 1899, 1900, 1902, 1903, 1919 and 1928. In the summer of 1939 a small crew was employed on the property. Some attention was paid to replacement-mineralization on which one cut was made. The principal effort was directed toward the discovery of quartz veins which might be expected to be gold-bearing, and a surface cut was made on one such vein. A cabin was built on the flat between the road and the river, about half a mile north-easterly from the Penny Creek crossing.

The ground covered by the claims includes low benches which extend some distance from the Bedwell River, and slopes which rise steeply from the benches. The creek south-west of Penny Creek is essentially at grade, but the basin of Penny Creek is hanging with respect to the river-valley. North-east of the creek a ridge, rising to about 1,500 feet elevation, separates the Penny Creek basin from the river-valley. The old workings are situated near the southern end of this ridge at approximate elevations from 625 to 825 feet. They are reached by a rough trail about seven-eighths of a

mile long, which leaves the main trail at a point west of Penny Creek. The new surface-cut on a gold-bearing quartz vein is situated on the steep eastern slope of the ridge at approximately 725 feet elevation and roughly a quarter of a mile north-easterly from the old workings. A rough trail about a third of a mile long runs north-westerly to this working from a point at the main road about half a mile north-easterly from the Penny Creek crossing.

The rocks underlying the Seattle are principally volcanics and recrystallized limestone of the Vancouver group, lying southerly from the projecting tongue of the Penny Creek intrusive. Aplite and quartz-diorite dykes, associated with the main intrusive are found in the rocks of the Vancouver group, and are more abundant at the creek and south-west of it than north-east of the creek near the old workings. The old workings consist of two adits, a shaft, and some surface cuts, all designed to explore replacement-mineralization. Garnet, epidote, magnetite, pyrite and chalcopyrite, in varying proportions, have replaced limestone and probably some volcanic rock. Some of this material is almost free of sulphides but one surface exposure, about 8 feet wide, appears to be rich in chalcopyrite. The old workings did not prove substantial tonnage of such mineralization and they will not be described here. Further reference to this type of mineralization appears under the headings "Vancouver Group" and "Replacement Deposits" earlier in this bulletin. In 1939 a surface cut was made in recrystallized limestone, about 5 feet wide, lying just west of rock composed almost entirely of garnet, epidote, magnetite and sulphides. Magnetite, pyrite, chalcopyrite and some sphalerite are disseminated through the limestone at the eastern side but the mineralization dies out about midway in the limestone. Selected well-mineralized material from the eastern side assayed: Gold, 0.10 oz. per ton; silver, 0.1 oz. per ton.

On the newly-discovered vein a surface cut runs for about 30 feet east of north along the foot of a bluff of fine-grained volcanic rock. It exposes a fracture of low dip northward, and other fractures branching downward from it which strike about due east and dip southward at moderate angles. In the fractures, vein-mineralization, consisting of quartz with some pyrite and a little galena, occurs with gouge of crushed wall-rock. Branching fractures near the southern end of the exposure swell to widths of 8 inches, but average much less. The main fracture is tight at the southern end of the exposure but widens to 3 or 4 inches in the central part and narrows again to about 1/2 an inch at the northern end. The following samples were taken from this cut.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
Main Fracture		
(1) Width 3 1/2 inches, 15 feet from southern end of cut.	0.32	Trace
(2) Width 4 inches, 22 to 24 feet from southern end of cut.	0.04	Trace
Branch below Main Fracture at southern end of cut		
(3) Average width 2 1/2 inches, 0 to 9 inches from main fracture.	0.14	Trace
(4) Average width 5 inches, 9 to 22 inches from main fracture.	1.22	Trace

AVON GROUP. (No.3 - Fig.1)

The claims, Jessie, Alice and Bunty, recorded in December 1938, and the Avon Extension No. 1 and Avon Extension No. 2 recorded in February 1939, are known as the Avon group. The recorded owners are, Messrs. Mackenzie, Matterson and the firm of Towler and Mitchell, all of Tofino. It is reported that the claims were optioned to Messrs. Marchant, Tait and Bruggy in 1939. G. W. Bruggy has been in charge of work on the property since midsummer of 1939.

The claims lie west of the Bedwell River about 3 miles from tidewater. A short branch-trail leads from the main Bedwell River trail to two cabins on the property at about 325 feet elevation, near the foot of a steep slope to the east. The workings are situated on the steep slope at elevations from 500 to 1,250 feet.

In the Annual Reports, Minister of Mines, British Columbia, for 1898, 1899 and 1900, there are brief references to the Castle which apparently covered ground now included in the Avon. Old workings, consisting of two shafts, an adit, and

some surface cuts, were designed to prospect magnetite-chalcopyrite-pyrite mineralization in recrystallized limestone, and fractures containing quartz-sulphide mineralization carrying values in gold. Recent workings consist of surface cuts and stripping along the course of a newly-discovered vein, and an adit which is reported to have been driven on this vein since the writer examined the property in September 1939.

The rocks underlying the property, consisting of quartz-diorite of the Penny Creek intrusives, diorite, limestone, andesitic and fine-grained amygdaloidal volcanics and granitic dykes, are well exposed on the bluffs and on the steep upper slopes. The Penny Creek intrusive underlies the western part of the property. At the eastern margin of the main intrusive there are small masses of diorite in intimate relationship with the quartz-diorite. The limestone is recrystallized and appears to be in discontinuous masses between the intrusive to the west and the volcanics to the east. The maximum width of limestone observed was about 80 feet. Numerous irregular granitic dykes were seen in the volcanics, east of the limestone and not far from the contact with the intrusive.

The principal rocks exposed and the relative positions of the workings, as of September 1939, are indicated on Fig. 2 accompanying this report. The three veins on which work has been done are designated for convenience as "A" Vein, "B" Vein and "C" Vein. The approximate positions from which samples were taken have been indicated by arrows connected with reference numbers enclosed in circles. Descriptions of samples and assays of the samples are given in the following notes.

"A" Vein, reported to be a recent discovery, is a fracture with varying widths of vein-mineralization and gouge. The strike changes at a number of points but is generally north of east and the dip ranges from 35 degrees to 60 degrees northward. The walls are of fine-grained volcanics, amygdaloidal at some points, and towards the western end are intruded by irregular masses of granitic rock. The vein was exposed in two sections by cuts and stripping, at the north side of, or in, a rocky gully. The eastern section, about 100 feet long, was separated from the 60-foot western section by a distance of approximately 650 feet. A short distance from the eastern section the topography suggests that a fault may cross the strike of the vein. West of this point both walls of the gully are steep. About 250 feet from the eastern section a small cut exposes 6 inches of gouge, thence to the western section the vein was not exposed.

The wall-rock along the fracture has been crushed and

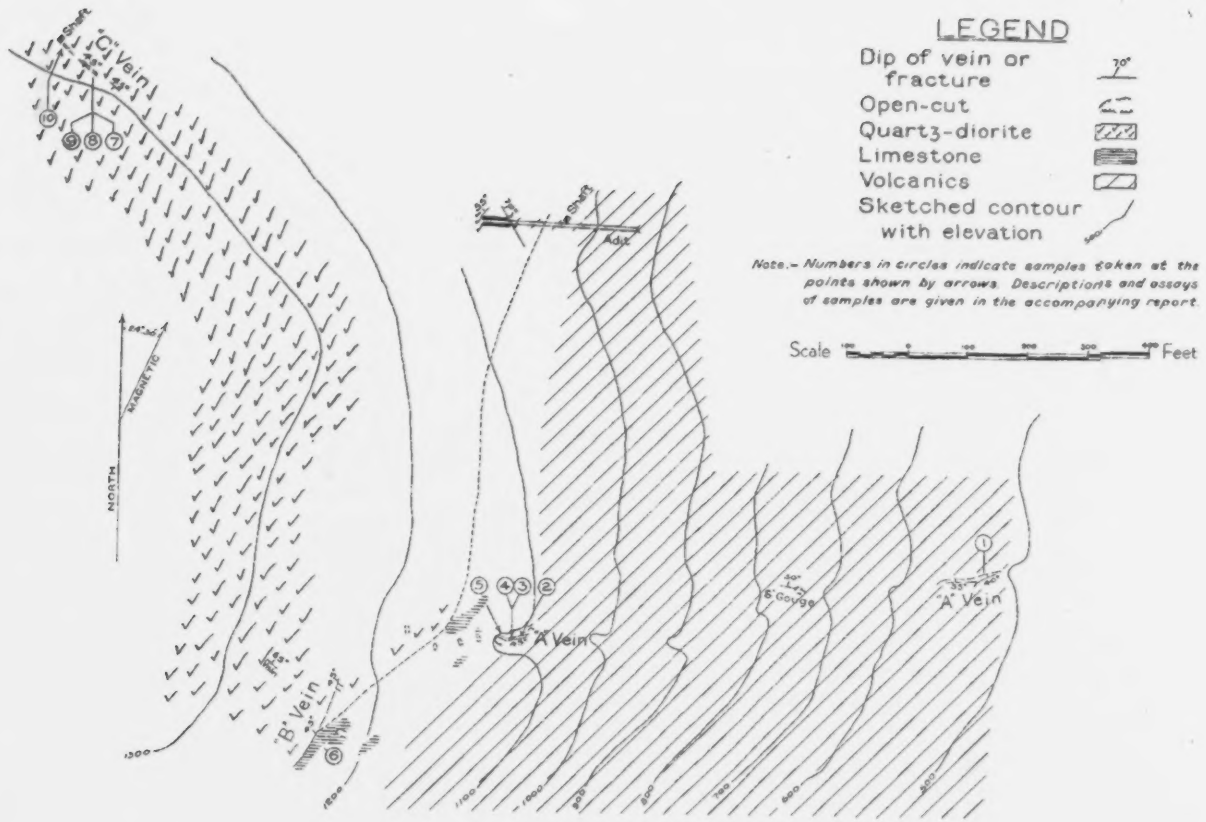


Fig. 2. Plan of workings, Avon group.

sheared for widths ranging from 1 inch to about 3 feet. Splits or strands diverge from the main fracture. Vein-mineralization consisting of quartz with some calcite, with or without sulphides, occurs as lenses in the main fracture and as the filling of the joints in the walls. The sulphides, which are generally sparingly distributed in the gangue-minerals, consist of pyrite, chalcopyrite and occasionally a little galena.

In the first 40 feet of the eastern section the fracture is very narrow, but west of the intersection with a joint there is from 6 inches to 30 inches of gouge and usually from 1 1/2 inches to 15 inches of quartz with some calcite and usually some sulphide mineralization. Sample No. 1 listed later in this report came from a point about 60 feet from the end of this section.

In the western section cuts exposed the vein for a length of about 60 feet at the eastern end of which the ground was faced up for an adit. The strike of the fracture changes markedly at two points. A few feet from the eastern end of this section sample No. 2 was taken across quartz 6 1/2 inches wide lying above a foot of gouge. To the west the vein narrows but widens again to about 14 inches. Sample No. 3 across gouge 8 inches wide at foot-wall, and sample No. 4 across 6 inches of quartz lying above the gouge, were taken about 25 feet west of No. 2. The quartz of sample No. 4 contained some pyrite and some galena. From a few feet beyond this point to the end of this section a cut follows rusty gouge, 10 inches to 15 inches wide, containing crushed quartz. Sample No. 5 was taken from the end of the cut. In this section a number of quartz stringers run into the walls from the main fracture. The fine-grained volcanics are invaded by small irregular masses of granitic rock. Epidote and some magnetite are developed in the altered volcanics.

Samples from "A" Vein

Sample No.	Description	Width Inches	Assay	
			Gold oz. per ton	Silver oz. per ton
1	Quartz with some sulphide.	8	0.26	1.9
2	Crushed wall-rock with some quartz.	6 1/2	Trace	Trace
3	Footwall-section, gouge with some quartz.	8	0.02	Trace
4	Hangingwall-section, quartz with some pyrite and galena.	6	2.50	1.1
5	Channel across vein, rusty gouge and crushed quartz.	15	0.12	Trace

Note: Samples 3 and 4 give section across vein approximately 25 feet west of sample 2.

West of the western section there is a shallow basin in which diorite, recrystallized limestone and altered volcanics outcrop at various points. Four cuts in 1 1/2 to 3 feet of overburden expose chlorite, magnetite and quartz as irregular contact-mineralization. About 275 feet west of the western section, a vein containing 2 to 7 inches of quartz with some sulphides in a 5-foot dacite dyke, is exposed in a bluff of quartz-diorite at the head of the basin. Both vein and dyke strike about north 40 degrees west and dip 65 degrees north-eastward.

"B" Vein. From a point about 350 feet south-westerly from the western cuts on "A" Vein, old cuts and stripping follow "B" Vein northerly for 125 feet. The average strike is east of north and the dip is about 45 degrees westward. At the southern end dacite and quartz-porphyry dykes follow the contact between limestone on the east and the quartz-diorite mass on the west. Here the vein cuts the dacite; farther north it diverges westerly from the contact into the quartz-diorite. There is fracturing for widths from a few inches to about two feet, the width being greatest towards the southern end. Quartz containing some pyrite, chalcopyrite and galena occurs as veins or lenses from 1 inch to 5 inches wide in the fractures. Sample No. 6 taken 40 feet from the southern end, across 2 1/2 inches of quartz containing some pyrite, assayed: Gold, 2.44 oz. per ton; silver, 1.2 oz. per ton. Selected well-mineralized material assayed: Gold, 5.44 oz. per ton; silver, 2.6 oz. per ton. Thence northerly to a cut at the end of the exposure the vein is in quartz-diorite and contains vuggy quartz 1 1/2 to 3 inches wide.

"C" Vein, which lies well to the north-west of the other showings, outcrops along quartz-diorite bluffs. It strikes about north-west and dips about 45 degrees south-westward. A shaft near the north-western end of the exposure is presumed to have been sunk in 1898 or 1899. From this point for about 110 feet to the south-east there is evidence of the vein, but it was covered by debris except at a few points. The quartz-diorite is cut by shears and joints parallel with the fracture along which there is decomposed and rusty material from 7 or 8 inches to about 2 feet in width. The following samples were taken from the rusty oxidized material exposed at the surface. The widths are measured normal to the dip of the vein.

Sample No.	Description	Width Inches	Gold Oz. per ton	Silver Oz. per ton
7	Rusty gouge at foot-wall.	5	2.44	Trace
8	Adjoining rusty quartz containing some pyrite and galena.	10	0.44	Trace
9	Crushed rusty wall-rock in hanging-wall of No. 8.	10	0.10	0.3
10	Crushed rusty vein filling just south-east of shaft.	12	Trace	Trace

Note: Samples 7, 8 and 9 give a section across the vein in a shallow cut about 70 feet south of the shaft.

Mineralized Limestone

The old workings on the property include a cut near the southern end of "B" Vein. This cut runs west exposing recrystallized limestone containing magnetite, with well-crystallized pyrite, and some chalcopyrite. The metallic minerals form a relatively small part of the whole. Other workings lying about 900 feet to the north consist of a shaft sunk from the surface and, an adit-crosscut. At the shaft there is a good deal of mineralized material consisting of magnetite with chalcopyrite, pyrite and some calcite. The mineralization was not exposed in place at the surface, and the shaft was not open. The adit was driven west for about 265 feet, from a point about 125 feet east of, and 120 feet lower than, the collar of the shaft. It passed through about 50 feet of limestone and ended at the contact between limestone and quartz-diorite, which lies west of the limestone. There is some chlorite and possibly some amphibole in the limestone near the contact, but little or no sulphide or magnetite mineralization. At the other contact, 50 feet from the face, there is an open fracture striking north 30 degrees west and dipping 70 degrees north-eastward. A quartz-diorite dyke lies on the north-eastern side of the fracture, and for 2 or 3 feet on the south-western side chlorite, magnetite and garnet replace the limestone. Away from the contacts the limestone is comparatively unaltered and unmineralized. The other rocks exposed in the adit consist of volcanics cut by irregular masses of quartz-diorite and by a dacite dyke.

GALENA GROUP. (No.4 - Fig.1)

The claims Galena No. 1 and Galena No. 2 were recorded in December 1938, in the names of R. Matterson and J. Von Brendel. They cover ground referred to under the same name in the Annual Reports, Minister of Mines, British Columbia, for 1899, 1900 and 1916. These reports refer to a 9-foot shaft and to an open-cut approach. Samples referred to in the 1916 report assayed: Gold, trace; silver, trace and 0.2 oz. per ton; copper, 21.4 per cent and 3.1 per cent. It appears that these represented selected material.

The property is reached by a branch-trail about half a mile long which leaves the main Bedwell River trail near the 3-Mile point. Accommodation consists of a well-built, artistic, shake-cabin. The old workings, at about 300 feet elevation, are situated near the foot of a steep slope to the Bedwell River. Timber and brush-growth are heavy except on the rock-bluffs.

The property is underlain by volcanic rocks of the Van-

couver group intruded by granitic dykes. The old workings consist of a 40-foot cut in rock, at the northern end of which there is a shaft which was full of water when the property was examined. A fairly strong joint, striking about north 25 degrees east and dipping 75 degrees westward, runs the length of the cut and forms the foot-wall of magnetite-chalcopyrite mineralization, which is exposed in the northern 25 feet of the cut. A set of joints striking about due north and dipping steeply, intersects the footwall-joint and the mineralization extends a short distance to the north along them. The western boundary of mineralization is irregular; the width is from 2 or 3 to about 15 inches. The mineralized material consists of altered volcanic rock more or less replaced by magnetite and chalcopyrite. A section studied microscopically consisted largely of diopside with masses of magnetite and chalcopyrite containing residual grains of diopside. Chlorite veinlets cut the diopside and the metallic minerals. The wall-rock is bleached and altered.

NOBLE AND NOBLE B. GROUPS. (No.5 - Fig.1)

The 14 claims included in the two groups were recorded in August and September 1938. The registered owners are, Noble Cornelius, Clarke Gibson, Earson Gibson, Gordon Gibson, John L. Gibson, and Julia E. Gibson. A cabin built on the south-western side of Noble (Clarke) Creek, at approximately 850 feet elevation, is reached by a branch-trail about a quarter of a mile long which leaves the Bedwell River trail a short distance easterly from the 5-Mile post. The claims cover ground on both sides of the creek, north of the river. Steep slopes cut by narrow draws flank both sides of Noble Creek. This part of the area has been burned over and dense second-growth now rises between the cedar snags.

The underlying rocks include andesitic and basaltic volcanics with some thin members which may be altered tuffs, intruded by dykes of quartz-diorite. The western contact of the Bedwell River batholith crosses the head of Dry Creek just east of Noble Creek. Numerous dykes extending westerly into the volcanics, and the pyrrhotite-chalcopyrite mineralization found near the contact, have been mentioned earlier in this bulletin.

When the property was visited early in August 1939, a number of veins had been discovered and open-cuts had been made on some of them, but development work was not extensive. Several of the reported discoveries were not examined by the writer. The veins which were examined were exposed near the creek between 675 feet and 875 feet elevation, and north-

east of the creek from approximately 1,200 feet to 1,725 feet elevation. Most of them are in the volcanics, apparently occupying joints along which there has been some shearing. The joints seem to have controlled the attitudes of some dykes, and one vein occurs in a 17-foot dyke of quartz-diorite. The veins exposed near the creek, the walls of the dyke, and a wider vein north-east of the creek, strike from 25 degrees to 40 degrees east of north. Most of the veins and the dykes dip from 65 degrees to 75 degrees south-eastward, one vein dips 80 degrees north-westward, and the wider vein stands vertically. The veins exposed at higher elevations north-east of the creek strike from due north to 20 degrees east of north and dip eastward from 60 degrees to 70 degrees. For part of its lower course the creek follows joints which strike about north 55 degrees west and dip 80 degrees south-westward. They are not mineralized where seen by the writer. One joint, striking north 70 degrees west and dipping 55 degrees southward, appears to offset slightly a vein-filled joint which strikes north 40 degrees east and dips 75 degrees south-eastward.

Most of the fissures occupied by veins pinch and swell locally and rarely exceed 8 or 9 inches in width, but north-east of the creek mineralization occurs in several shears which reach widths of 2 feet or more. Quartz, carbonate and sulphides occur as lenses or veins in the partly-replaced sheared wall-rock. The sulphides rarely form more than a moderate percentage of the vein-filling. Along some of the wider fractures, the wall-rock has been bleached and in some cases silicified for a few inches from the veins. The sulphides include pyrrhotite, chalcopyrite, marcasite, galena, some sphalerite and probably some pyrite. Pyrrhotite and chalcopyrite are the most common. Marcasite is probably derived from pyrrhotite. Galena with some sphalerite occurs as narrow lenses or streaks in the veins. Free gold was reported from several of the veins. The writer took several samples, most of which were of vein-material carrying an appreciable quantity of sulphides and represent the better-mineralized veins or parts of veins. The assays and other data concerning these samples are listed in the following table.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
Veins at creek, below cabin		
(1) South-western side of creek. Average 3 inches wide, quartz with sulphides.	1.54	0.6
(2) North-western side of creek, 50 yards below No.1, 2 1/2 inches, quartz with sulphides.	0.12	0.1
At south-western side of creek, above cabin		
(3) 1 1/2 inches, vein with sulphides, at foot-wall of dyke.	2.04	1.2
(4) Vein in dyke 2 feet from foot-wall. Best mineralized material near floor of cut, quartz and sulphides.	0.58	0.2
Veins north-east of creek		
(5) "Sulphide Vein," sample across 19 inches, at bottom of exposure.	0.30	0.2
(6) "High Grade Lead" in narrow draw at 1,725 feet elevation, 9 1/2 inches vein-matter, not much sulphide.	0.60	0.1
(7) 50 feet down slope on same vein, 7 inches vein-matter, well-mineralized at hanging-wall.	0.80	0.1
(8) Probably parallel vein a short distance east of "High Grade Vein" and 175 feet down slope from No. 7.		
4 1/2 inches quartz and sulphides	0.90	0.7
Selected sulphides	4.00	0.8

The rugged nature of the country and the heavy growth made it difficult to determine closely the relative positions of the showings, and with the closely-spaced parallel veins, made it impossible in some cases to be sure whether or not nearby exposures are on the same vein.

One of the longer exposures is on the "sulphide lead," on the steep bluffs north-east of the creek between 1,200 feet and 1,300 feet elevation. It consists of shearing from 1 foot to 3 feet wide, in fine-grained volcanic rock. The shear strikes about north 35 degrees east and dips almost vertically. In the shear there is quartz confined principally to a width of 6 or 8 inches and the rest of the shear consists of altered wall-rock with which there is some actinolite. Pyrrhotite, chalcopyrite and marcasite are found in the quartz and disseminated through the sheared wall-rock. A branch-fracture to the west of the main break contains 8 or 9 inches of quartz. Sample No. 5 in the preceding table was taken across 19 inches, the full width of the shear at the bottom of the exposure. This exposure is well toward the eastern part of the property, not far from the Belvidere.

On the steep slope north-east of the creek, about one half mile north-westerly from the "sulphide lead," there are several fractures which contain lenses and veins of quartz and carbonate and partly-replaced sheared fine-grained volcanic rock. Pyrrhotite, chalcopyrite and occasionally galena and sphalerite, occur in the vein-matter and disseminated through the altered rock within the fractures and sometimes in the walls. The wall-rock is sheared for widths up to 2 feet. At one point a width of 18 inches consists largely of quartz practically without sulphides. At another, narrow quartz stringers occur for 2 or 3 feet in the foot-wall of a 3-inch vein of quartz and carbonate. The 3-inch vein contains some sulphides, but the foot-wall stringers are essentially free from sulphides. The better-mineralized parts of the veins that were seen, are from 3 to 9 inches wide.

O. K. GROUP (No.6 - Fig.1)

On September 9th 1939 the writer was guided by N. W. McIvor to showings, north of the Bedwell River and east of Dry Creek. These showings appeared to be on ground covered by the claims O. K. No. 3 and O. K. No. 4 of which the number one posts were found. According to the inscription on the posts, the claims were staked on April 27th, 1939, the O. K. No. 3 by D. Shepherd and the O. K. No. 4 by Shepherd as agent for McIvor; they were recorded in April 1939.

The showings are about half a mile north of the river,

from 1,500 to 1,650 feet elevation, on the steep slope rising from a flat which extends for some distance north of the river. The underlying rock is quartz-diorite. A fracture, exposed along the bluffs, strikes from 70 degrees to 80 degrees west of north and dips from 45 degrees to 55 degrees northward. About 75 feet from the western end of the exposure, at approximately 1,600 feet elevation, a cut has been made under an overhanging bluff. For a length of 15 feet the cut exposes a fracture, 2 1/2 to 6 inches wide, containing ribboned quartz 2 to 3 inches in width, and sheared wall-rock. There is a little fine-grained pyrite in the sheared and altered wall-rock within the fracture, but the quartz contains very little sulphide mineralization. The face of the overhanging bluff extending for about 175 feet easterly from the cut probably represents the hanging-wall of the vein. About 200 feet easterly from the cut a small open-cut has been made on the west side of a draw which cuts into the bluffs to the north. In the open-cut the fracture is from 8 to 10 inches wide, and contains from 1 inch to 2 inches of gouge along the sides of 5 1/2 to 6 1/2 inches of sulphide-bearing quartz. The vein is exposed for about 3 feet along the strike over a vertical range of 2 1/2 feet. There is but little sulphide mineralization at the top or bottom of the exposure, but in the middle there is heavy sulphide mineralization consisting of sphalerite, pyrite and some galena. A sample across 6 inches of well-mineralized vein assayed: Gold, 0.1 oz. per ton; silver, 6.3 oz. per ton. On the east side of the draw, 30 to 40 feet away, at about 1,500 feet elevation, the vein is exposed striking north 80 degrees west and dipping 45 degrees to 50 degrees northward. In the first 5 feet the quartz widens from 6 to 10 inches, it is exposed again 5 feet farther east, 2 1/2 inches wide, and 2 feet to the south a quartz vein 6 inches wide is exposed. The 6-inch vein may be a split from the other fracture. The vein had not been followed east of this point. In the 5-foot section in which the vein widens from 6 to 10 inches there is gouge 1 inch to 2 inches thick along the walls. In the easterly 2 feet of this section, along the footwall-side, there is heavy sulphide mineralization which at the eastern end is 2 1/2 inches wide. The rest of the quartz contains but little sulphide mineralization.

The two following samples were taken giving a complete cross-section of the vein mineralization at the widest point.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
2 1/2 inches heavy sulphides at foot-wall	2.80	13.8
7 1/2 inches quartz with little sulphide mineralization, from previous sample to hanging-wall.	0.60	2.6

MUSKETEER AND SHAMROCK GROUPS. (No.8 - Fig.1)

The eight claims of the Musketeer group and five claims of the Shamrock group were recorded in September 1938. A registered agreement covers the sale of the claims by Patrick McCrory to Musketeer Mines, Limited, (N. P. L.), a company with head office in Vancouver.

The property is situated south of Bedwell River on lower Sam Craig Creek. It is reached by a branch-trail which runs southerly from the main trail at a point about 7 1/4 miles from the head of Bedwell Sound. The branch-trail crosses the river at a little less than 600 feet elevation, at a point easterly from Sam Craig Creek. The river-channel at the crossing is wide, it can be forded by horses except during high-water. Foot-logs across the river are apt to be carried away by high water. The branch-trail reaches a lower camp on the eastern side of Sam Craig Creek at approximately 625 feet elevation, about a third of a mile from the river. The trail then crosses to the western side of the creek and climbs to an upper camp at approximately 950 feet elevation, about three quarters of a mile from the river. Both camps were of a temporary nature in 1939.

On both sides of lower Sam Craig Creek the surface is irregular. Rocky knolls and ridges are separated by swampy depressions and narrow draws. The average slope is steep northward to a small flat along the river. Overburden is deep in the flatter areas, surface cuts have gone down as much as 10 feet without reaching bed-rock. Tree-growth is fairly heavy on the flat and on the lower slopes where the rock is covered by drift.

The discovery in 1938 of the Musketeer vein on the eastern side of Sam Craig Creek did much to stimulate the present activity in the Bedwell River Area. The property consist-

ing of the Musketeer and Shamrock groups was optioned in the autumn of 1938 to a group including Pioneer Gold Mines of B. C., Limited, of Vancouver, and Anglo Huronian Limited, of Toronto. The option was later transferred to Musketeer Mines Limited, (N. P. L.), incorporated on June 21st, 1939.

Development work was started at the property in the autumn of 1938 and since then has ceen carried on continuously. Prospecting has revealed several veins on which surface work has been done. Because the depth of overburden makes exploration by surface workings difficult, four veins have been explored by adits driven at shallow depth. The early work was done by hand; but in the autumn of 1939 arrangements were made to develop water-power on the property, with a view to using rock-drills for a low-level adit, and to provide power for possible milling operations in the future.

Fig. 3 accompanying this report shows the relative positions of most of the workings on the property of Musketeer Mines, Limited, in August 1939. The approximate positions from which the writer took samples have been indicated on Fig. 3 by arrows connected with reference numbers in circles. Descriptions of most of the veins and workings on the property are included in this report, but one or two showings indicated on Fig. 3 are not described.

When the writer examined the property, underground-work had been suspended, and a campaign of diamond-drilling was in progress. Various development-faces of that time have since been advanced, and an adit-crosscut has been started from a point near the eastern side of Sam Craig Creek convenient to the lower camp, north of the area covered by Fig. 3. This adit, about 300 feet lower than the "Main Drift" on the Musketeer vein, is being driven southerly to intersect the downward projection of the Musketeer vein at a distance estimated roughly at 900 feet.

The writer wishes to express his thanks to F. Joubin, engineer for Musketeer Mines, Limited, and to J. Merritt, then foreman, who generously supplied information concerning the property and the Bedwell River Area, of great assistance in the field and in the preparation of this report.

The property, situated about a mile from the western margin of the Bedwell River batholith, is underlain by granitic rocks which show some range in texture and composition but consist principally of quartz-diorite. Some finer-grained granitic rock, outcropping along the trail between the camps, is probably intrusive into the quartz-diorite. Several dykes

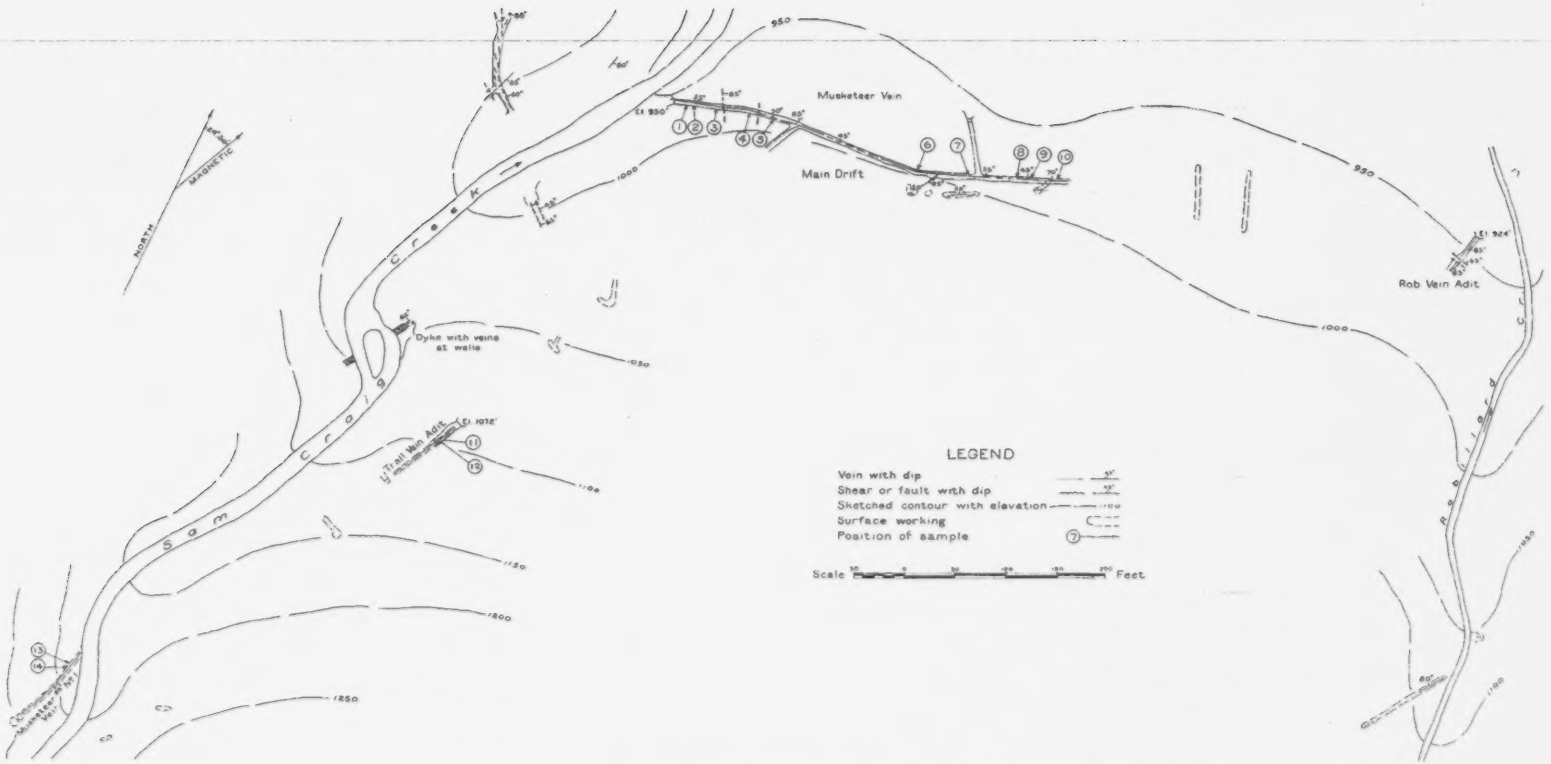


Fig. 3. Plan of workings, Musketeer and Shamrock groups.

on the property are andesite and some others, too altered for definite determination, are probably andesitic. The granitic rocks and the dykes have been altered hydrothermally near the shears and fractures.

The veins so far discovered are in fractures along which there has been more or less shearing and which on their attitudes may be divided into two groups. The one group consists of fractures which strike from 10 to 30 degrees east of north and range in dip from 85 degrees westward to perhaps 80 degrees eastward. Some of these fractures follow the walls of andesitic dykes of the same general attitude. The other group consists of fractures striking from about north-east to almost due east and dipping north-westward or northward at angles from 45 degrees to 75 degrees. The Musketeer vein, belonging to the second group, cuts and slightly offsets the Trail vein, belonging to the first group. The veins are cut by shears which strike from 30 to 80 degrees west of north and dip northward or north-eastward at angles from 45 degrees to 85 degrees. There is some faulting of veins by the shears, the horizontal displacements observed are of the order of a few feet or less.

Most of the veins have sections which are ribboned by fracturing in the vein-filling parallel with the walls. In the easterly-striking veins the ribbon fracture-surfaces and the walls of the veins are marked by fine grooving which is essentially horizontal. The walls of a shear which faults the Musketeer vein are also marked by grooving which pitches about 55 degrees north-westward.

The vein-fractures usually contain gouge along the walls. Introduced vein-matter consists of quartz with more or less white carbonate gangue and varying proportions of sulphides. The width of the vein-matter observed ranged from a fraction of an inch to about a foot and probably averages less than 6 inches. The quartz, in general, is an aggregate of crystals recognizable with the unaided eye. The sulphides consist of pyrite, sphalerite, galena and chalcopyrite. The pyrite is frequently in coarse crystals. Some good crystals of sphalerite were found in one vein. The sulphides occur following the ribbon-planes in some ribboned-parts of the veins and as irregular masses which may form a large part of some unbanded parts of the veins. Free gold, generally quite fine, has been found in several of the veins.

The sulphides are distributed quite irregularly in the veins and the sulphide content varies greatly from point to point in the veins. In a general way it has been observed that the gold tends to occur in the parts of the veins car-

rying appreciable percentages of sulphides. As a measure of the sulphide content the writer had the total sulphur contents determined in the samples from this property. In the samples from the Musketeer vein the sulphur ranged from a fraction of 1 per cent to 7 per cent. The higher figure is probably equivalent to more than 15 per cent combined sulphides. Samples from the other veins ranged as high as 24 per cent. sulphur, equivalent to more than 47 per cent. combined sulphides. Samples taken by the writer assayed from nil to more than 10 ounces in gold per ton. Samples containing much sulphide mineralization gave high assays in gold; and generally vein-matter moderately well-mineralized with sulphides gave better values than material poor in sulphides. The ratio of gold to total sulphides is not constant and in the samples of medium and low sulphide content the gold does not follow the total sulphide content consistently. It is possible that quantitative determination of the individual sulphides present would indicate a more constant relationship between the gold and one or more of them than is apparent between the gold and the total sulphide content.

Some further light was thrown on the relationship of the gold and sulphides by microscopic study of polished sections of the ore. The sections studied consisted of well-mineralized vein-matter. It was apparent that the sulphides were developed in fractures in the quartz, and that pyrite is the oldest sulphide. Galena and possibly chalcopyrite are later than sphalerite and the three are later than pyrite. Grains of free gold were observed, at the margins of the pyrite grains, at contacts between pyrite and galena grains, at the margins of the galena grains, with galena in the veins which cut sphalerite, and in the gangue away from the sulphides.

The coincidence of the gold and sulphides may be explained by the theory that the parts of the vein most subject to successive re-opening by fracturing received the sulphides in their order, and received gold with or subsequent to the later sulphides. The later fracturing may have failed to open channels in some parts of the vein moderately well-mineralized with early sulphides, and may have opened channels to some poorly-mineralized parts. Thus moderately well-mineralized vein-matter may be low in gold and some poorly-mineralized vein-matter may assay well in gold, although generally the well-mineralized vein-matter is richer in gold than is that which carries little sulphide mineralization. Since the gold occurs largely as grains of free metal it is not to be expected that the ratio with the total sulphide content or with an individual sulphide would be constant. The microscopic study suggests that as an indicator of gold values galena would be better than pyrite.

Musketeer Vein

Surface cuts in deep overburden expose this vein for a short part of its known length. Because of the depth of the overburden the vein was explored by an adit-drift driven easterly from Sam Craig Creek at rather shallow depth. This adit, at approximately 950 feet elevation and known as the "Main Drift," had followed the vein easterly from Sam Craig Creek for about 407 feet when the property was examined in August 1939. About 125 feet from the Sam Craig Creek portal a branch-drift had been driven 35 feet southerly, following the Trail vein; and about 317 feet from the Sam Craig Creek portal a crosscut entry, driven from a point about 60 feet north-westerly, makes connection with the drift. The portal of this entry is on the eastern side of a low ridge on the eastern side of Sam Craig Creek.

The strike of the vein changes markedly at two points in the drift. In the western section the strike is about north 73 degrees east. At 85 feet from the western portal the vein is cut by a shear which strikes west of north; in the middle section, easterly from this shear, the vein strikes about north 85 degrees east. About 255 feet from the western portal the vein swings to the left and continues thence on a strike of north 68 degrees east. For most of the exposed length the vein dips from 45 to 55 degrees northward but it steepens toward the eastern end of the "Main Drift," and 90 feet from the crosscut-entry dips 75 degrees northward. Approximately 50 feet from the western portal the vein is cut by a north-westerly-striking shear. At the shear the eastern segment of the vein is displaced about a foot to the south, relative to the western segment. At the intersection of the Musketeer and Trail veins the segment of the latter, north of the Musketeer vein, is displaced about 2 feet to the west relative to the segment south of the Musketeer vein.

For most of the exposed length the Musketeer vein is a fracture with gouge along the walls and contains vein-matter from 1 1/2 to 7 inches wide. The vein-matter consists of quartz, a little calcite and irregularly-distributed sulphide minerals. Much of the vein is ribboned or banded by fractures parallel to the walls and, in parts of the ribboned vein, sulphides are developed along the ribbon-fractures. Some parts of the vein show no banding and may contain but little sulphide mineralization or may be well-mineralized with sulphides in irregular masses. The sulphides include pyrite, sphalerite, galena and a minor amount of chalcopyrite. It is reported that fine free gold has been found at a number of points in the vein.

At the western portal of the "Main Drift" the Musketeer vein is from 3 to 5 inches wide. About 15 feet north-easterly it has widened to 7 inches where for 2 feet the vein, consisting of white quartz with a little sulphide mineralization, is completely crushed. This narrows to solid well-mineralized quartz 4 1/2 inches wide, thence to the shear, at 50 feet, the vein is from 3 to 4 1/2 inches wide. Thence easterly to the next shear, a distance of about 35 feet, the vein-matter consists of ribboned quite well-mineralized quartz, 3 to 5 1/2 inches wide. Thence easterly for about 70 feet to a point past the branch-drift the vein-matter is from 1 1/2 to 4 1/2 inches wide. In part it consists of rusty gouge, but for most of this section it consists principally of ribboned quartz. From the intersection with the Trail vein easterly for about 30 feet, to the end of this section, the Musketeer vein is from 1 1/2 to 4 1/2 inches wide and consists of ribboned quartz quite well-mineralized with sulphides. High assays in gold are reported from sampling of this section of the vein.

About 30 feet easterly from the branch-drift the Musketeer vein passes into a shear from 1 1/2 to 2 1/2 feet wide which continues for about 70 feet, striking north 85 degrees east and dipping about 45 degrees northward. At several points strands which make small angles with the main shear run off into the walls. Narrow stringers or lenses of quartz with some sulphides are found along the sides of the main shear. It is reported that regular sampling across the width of the shear yielded assays of a few hundredths of an ounce of gold per ton.

At the eastern end of this section the usual type of vein, filling a narrow fracture, comes in again. It is 1 1/2 to 3 1/2 inches wide and quite well-mineralized with sulphides for 30 feet easterly, continuing on the strike of the shear. In the next 20 feet the strike changes to about north 68 degrees east, the dip steepens to 55 degrees northward, and the vein-matter widens to a maximum of about 7 inches near the middle of the section, diminishing to 3 inches at the eastern end. Approximately at this point the drift has been widened at the southern side where a narrow fracture runs off in a southerly direction. The fracture strikes about north 30 degrees east and dips 85 degrees south-eastward. It contains quartz 1/4 to 1/2-inch wide mineralized with sulphides. It is reported that fine free gold was found in the main vein near this point.

The crosscut-entry is about 42 feet easterly from this point and in August 1939 the face of the drift was about 90

feet beyond the crosscut. For the first 15 feet the width is less than 3 inches but in the next 107 feet to about 80 feet past the crosscut-entry the vein-matter, ranging from 2 1/2 to 8 inches, averages between 5 and 6 inches in width. In this section sulphides probably form less than 3 per cent of the vein-matter except where there are local concentrations; one such concentration occurs at a point 10 feet westerly from the crosscut-entry. The last part of the drift was driven through badly-shattered ground and in the last 10 feet the vein ranges from 1 1/2 to 3 inches wide. The dip here is 70 degrees northward. The face of the drift has been advanced since the property was examined.

Ten samples taken from the Musketeer vein in the "Main Drift," at positions indicated on Fig. 3, were principally from the parts of the vein regarded as most apt to contain substantial values in gold. This excludes the part of the drift following the wide shear. The samples give an indication of the range of widths and values but were not closely enough spaced to permit estimates of average widths and values. The data from this sampling are shown in the following table.

Sample No.	Width Inches	Description	Assay	
			Gold oz. per ton	Silver oz. per ton
1	7	White crumbly vein-matter, little sulphide mineralization.	0.14	Trace
2	4 1/2	Quartz with sulphides.	4.95	4.1
3	4 1/2	Banded vein with some sulphides and gouge.	2.34	1.6
4	3	Banded vein-matter with sulphides.	2.64	1.2
5	4	Rusty quartz, some sulphides.	1.64	0.6
6	6 1/2	Banded quartz, well-mineralized with sulphides.	3.00	2.8
7	5 3/4	Banded quartz with sulphides.	1.56	1.2
8	6 1/2	Quartz with some sulphides.	0.56	0.6
9	6 1/2	Crushed vein-matter, quartz with some sulphides.	0.96	1.0
10	6	Quartz with some pyrite.	0.30	0.1

The Trail vein is exposed in an adit; in the surface cuts extending southerly from the adit; and in a branch-drift running southerly from the "Main Drift" on the Musketeer vein. The average strike of the vein is 15 to 20 degrees east of north, the dip is nearly vertical. The width of the vein ranges from a fraction of an inch to 12 inches. In the branch-drift southerly from the "Main Drift," as far as shown on Fig. 3, the vein consists of very narrow fracturing containing quartz and some sulphides. On the northern side of the "Main Drift" the Trail vein is displaced about 2 feet to the west of the segment on the southern side of the "Main Drift." It is reported that since the property was examined the branch-drift on the Trail vein has been extended southerly for about 350 feet in which distance the width increases to as much as one foot; and that for a length of about 70 feet, values, regarded as commercial, were obtained. The portal of the Trail vein adit is about 122 feet higher than, and 400 feet southerly from the western portal of the "Main Drift" on the Musketeer vein. The Trail vein adit, in about 33 feet when the writer examined it, was timbered for about 20 feet from the portal. It is reported that this working was also extended southerly. Where not concealed by timber, the vein ranges from 1 1/2 to 12 inches in width, it has very irregular walls and in part is frozen to one wall. The wall-rock is greatly altered. The vein-matter consists of well-crystallized vuggy quartz, much of which is heavily mineralized with sulphides. The sulphides, pyrite, sphalerite, galena and a little chalcopyrite, are arranged in bands parallel to the walls of the vein; and form from 2 to 3 to perhaps 40 per cent. of the vein-matter. The pyrite is in coarse well-formed crystals and some of the sphalerite is also well-crystallized. The writer took two samples toward the inner end of the working.

Sample No.	Width Inches	Description	Assay	
			Gold oz. per ton	Silver oz. per ton
11	8 1/2	Heavily-mineralized vein-matter.	9.34	6.4
12	7	Quartz with much less sulphides, near heavily-mineralized section.	12.04	6.0

A cut exposes the vein for about 80 feet southerly up the slope from a point a few feet southerly from the adit-portal. The vein exposed is from 2 1/2 to 8 inches wide and

contains much sulphide mineralization. About 65 feet from the lower end of the trench, quartz striking about south 10 degrees west, diverges from the vein when followed southerly. It is 2 to 8 inches wide and contains little or no sulphide mineralization, but contains sericite and some ankeritic carbonate. It is white in contrast with the rusty main Trail vein. Southerly from this trench, cuts in deep overburden expose vein-mineralization at two points.

Rob Vein

Some surface workings and a 45-foot adit on the western side of Robillard Creek, indicated near the right hand side of Fig. 3, expose vein-mineralization in a narrow fracture which strikes about north 15 degrees east and dips about 85 degrees south-eastward. The vein-mineralization from 2 1/2 inches to 8 inches wide, consists of quartz with more or less sulphides. Parallel shears, striking north 70 degrees west and dipping 65 to 70 degrees south-westward, cut the vein. In the adit the shears were encountered between 28 and 33 feet from the portal. The vein on the southern side of the shears is offset 3 1/2 feet toward the east, relative to the segment on the northern side. The vein, from 3 to 8 inches wide for 25 feet from the portal, is heavily mineralized with sulphides at the portal and well mineralized for the rest of the distance. Beyond 25 feet from the portal it narrows, and at the southern side of the shears it consists of quartz 3 to 5 inches wide containing 2 or 3 per cent pyrite and some chlorite. Sampling indicated high values in gold for the heavily-mineralized material and low values for the poorly-mineralized material on the southern side of the fault. A cut on the eastern side of the creek exposed shearing but did not expose vein-mineralization.

Musketeer No. 1 Vein

This vein can be seen under the water for about 50 feet along the western side of Sam Craig Creek at about 1,200 feet elevation. It has been exposed by stripping extending southerly up the slope on the western side of the creek. Two cuts, in deep overburden, short distances southerly from the end of the stripping did not expose the vein. These workings, indicated in the lower left hand corner of Fig. 3, expose a sheeted zone 2 to 3 feet wide in which closely spaced sub-parallel joints or fractures strike about north 15 degrees east and dip about 85 degrees eastward. Along the eastern side of the sheeted zone there are some narrow stringers of quartz. Along the western side vein-mineralization, consisting of quartz with some calcite irregularly mineralized with sulphides,

ranges from 3 to 8 inches in width, pinching or swelling in short distances. The sulphides, pyrite, sphalerite, galena and chalcopyrite, in small aggregates irregularly distributed through the gangue, form roughly 1 to 15 per cent. of the vein matter. Two samples were taken from this vein.

Sample No.	Width Inches	Description	Assay	
			Gold oz. per ton	Silver oz. per ton
13	7 1/2	Well-mineralized quartz, 10 feet above creek.	4.54	3.0
14	5	Quartz with some pyrite, 14 feet above creek.	1.28	0.6

Note: Sulphides formed roughly 15 per cent. of sample No. 13, and 3 per cent. of sample No. 14.

Bonus Vein

An adit-drift on this vein is situated about 1,500 feet almost due west from the Trail vein adit. The Bonus adit is at approximately 1,400 feet elevation on the north-western side of a north-easterly-trending draw. At intervals in the draw, for about 800 feet down-stream from the adit, there are exposures of shearing in the quartz-diorite. The shearing trends north-easterly and dips steeply south-eastward. The wall-rock is greatly altered and at some points quartz and some pyrite are developed in the shear. South-westerly from the adit-portal, at higher elevations, there are indications of the shear, and at about 175 feet ribboned quartz 5 inches wide is exposed. The adit follows the shear south-westerly for about 100 feet. At the portal quartz 4 to 6 inches wide contains very little sulphide mineralization. The wall-rock is greatly altered on both sides of the shear for a total width of about 5 feet. This vein was not sampled by the writer.

BUCCANEER GROUP. (No.9 - Fig.1)

The Buccaneer group consists of the eight claims, Dictator No. 1 to 8 inclusive, recorded in November 1938. Buccaneer Mines, Limited, N.P.L., with head office in Vancouver, is the registered owner. The claims are situated south-east of the property of Musketeer Mines, Limited, and are reached by a continuation of the trail which serves

that property. The Buccaneer camp, at about 1,700 feet elevation, is about 1 3/4 miles by trail from the upper Musketeer camp. On the Buccaneer, the surface generally slopes steeply. It is cut by draws and by depressions, which cross the general slope leaving swampy areas and isolated rock-hummocks. Quartz-diorite underlies the property.

When the property was examined in August 1939 the ground had been faced up for an adit-portal, at approximately 1900 feet elevation. From the portal to a point roughly 500 feet south 30 degrees west, at 2040 feet elevation, there were cuts at intervals along the course of a vein. Thence about 225 feet, south 55 degrees west, across a swamp, a cut, at 2050 feet elevation, exposed similar vein-material. A new camp was being constructed when the property was examined. It is understood that after the camp had been constructed underground work was commenced and has continued since that time. It is reported that a second adit has been started and that an arrangement has been made with the Bralorne Mines, Limited, whereby that company has taken over the property.

The vein consists of a branching quartz-filled fracture in an andesite dyke. The dyke was not well exposed in the surface cuts, but appeared to be 8 or 10 feet wide. Probably the attitude of the dyke does not differ greatly from that of the vein, which strikes about north 25 degrees east and dips from 75 degrees to 85 degrees south eastward. In detail the walls appear irregular and the width ranges from 1 1/2 to 10 inches. Parts of the vein are sheeted or ribboned parallel with the walls. Sulphides consisting of scattered grains of chalcopyrite, galena and possibly some pyrite, form a minor percentage of the vein-filling. Some fine particles of free gold were seen in quartz from the surface cuts.

In the upper half of the face at the adit-portal, ribboned quartz averaged about 3 inches wide between well-defined walls. Midway down the face the foot-wall cuts across to a parallel slip which from the intersection to the floor formed the foot-wall of quartz 10 inches wide. A sample across the ribboned quartz, 3 inches wide, assayed: Gold, 1.70 oz. per ton; silver, 0.4 oz. per ton; and a sample across the 10 inches of quartz, lower in the face, assayed: Gold, 0.62 oz. per ton; silver, trace. Dyke-rock was exposed for 2 1/2 feet in the hanging-wall of the vein, and for about 6 feet in the foot-wall.

In the 500-foot section extending south-westerly from the portal there were 15 cuts through overburden, usually not more than 2 feet deep. In a cut about 70 feet from the portal

a sample was taken across 5 inches of ribboned quartz which assayed: Gold, 3.30 oz. per ton; silver, 0.8 oz. per ton. In the cuts between 450 and 500 feet from the portal, the vein shows a tendency to split and some of the branches run into the quartz-diorite at the west wall of the dyke. From this point southerly the vein was not exposed on the projection of the strike. For some distance the ground is swampy and the overburden may be a good deal deeper than elsewhere. About 225 feet to the south-west, across the swamp, a single cut exposes a similar vein, about 125 feet westerly from the projection of the vein exposed in the 500-foot section. This vein is also near the eastern wall of a dyke and its attitude is about the same as the vein in the 500-foot section. A sample across the vein here averaging 3 3/4 inches wide, assayed: Gold, 2.60 oz. per ton; silver, 0.8 oz. per ton. This exposure may be on a parallel vein or may be a faulted segment of the vein exposed in the 500-foot section, in which case the fault may lie below the swamp.

YOU GROUP. (No.10 - Fig.1)

The four Crown-granted claims: Ex, Lot 1644; Ten, Lot 1645; You, Lot 1646; and Eight, Lot 1647, were recorded in 1912 and were Crown-granted in 1921. The registered owner is John David McLeod of Vancouver. The claims are situated in the eastern part of the area and extend in a line from the slopes of Big Interior Mountain westerly across You Creek. Approximately 12 miles from the head of Bedwell Sound a branch leaves the main Bedwell trail on the north side of You Creek and, in a little less than a mile, climbs about 1,100 feet to the You camp. The trail passes through burned territory and is in poor condition.

Work was done on the You at intervals from the discovery in 1912 until about 1934. References appear in several Annual Reports, Minister of Mines, British Columbia, from 1913 to 1933 inclusive. In that period an adit-drift about 340 feet long and a lower one about 7 feet long were driven, several surface cuts were made, and log buildings were constructed for various purposes. A small mill built about 150 feet below the longer adit was connected with the adit by a wire-tramway. The property had been lying idle for some years when the writer examined it in 1939. The buildings have suffered somewhat through time and the camp-building is now quite dilapidated.

The workings are situated on the north-eastern side of You Creek. A tributary, which flows south-westerly into You Creek in a series of cascades, occupies a narrow gorge to about 2,000 feet elevation, where it enters a shallower gully. The upper adit-portal is in the gorge at the north-western

side of the tributary creek at approximately 2,000 feet elevation. The camp building, at approximately the same elevation, is situated a short distance north of the tributary on the main slope to You Creek and a blacksmith's shop also at about the same elevation is situated just south of the tributary. The lower adit, the cuts between the two adits, and the mill, are situated on the slope to You Creek north of the tributary.

The upper adit is a drift which follows a vein for about 340 feet. North-easterly from the portal of the adit the vein is exposed at intervals in the bed of the creek. Because of the precipitous nature of the country the creek was not followed above a 30-foot waterfall, the foot of which is about 295 feet north-easterly from the portal and 225 feet higher than the adit. As exposed in the creek and in the adit the main vein-fracturing follows the north-western wall of a light-greenish andesite dyke, from 8 inches to about 4 feet wide, which cuts through quartz-diorite. The north-western wall of the vein is quartz-diorite except for a short distance in the drift about 290 feet from the portal, and approximately vertically above that point in the creek at the 30-foot waterfall. Here the fracture cuts through a split or branch-dyke which, followed westerly, diverges from the main dyke. The fracturing along the wall of the main dyke is somewhat sinuous but has an average strike of about north 60 degrees east. Steep dips both north-westward and south-eastward were observed, the average dip is close to vertical. In the quartz-diorite north-westerly from the main fracture, branch-fractures were observed, which when followed easterly converge with the main fracture. Their relationship with the main fracture is thus the same as that between the branch and main dyke.

In the main fracture, along the dyke, vein-matter consists of quartz with some carbonate gangue irregularly mineralized with sulphides. The vein ranges from 3 to 27 inches but usually is less than a foot wide. There is usually from 1/2 an inch to two inches of gouge along the walls of the fracture. In general the gouge consists of crushed wall-rock but at some points it contains quartz and sulphides. The white carbonate gangue occurs in irregular masses along the vein. Parts of the vein are ribboned by fracturing parallel with the walls. Sulphides occur as bands in parts of the vein, and locally in some unbanded parts form important percentages of the total vein-material, but much of the vein consists of white gangue containing very little sulphide mineralization. Pyrite is the most abundant sulphide; chalcopyrite, sphalerite and some galena are also present. Microscopic study of a polished section revealed the presence

of blebs of pyrrhotite within masses of chalcopyrite. Chalcopyrite and sphalerite occupy fractures which cut the pyrite. Free gold has been reported from the property. Sampling by the writer indicated a rather close association of gold with the sulphides. The silver content while not high, is higher than in many other samples taken in the area. Tetrahedrite has been reported from this vein, but was not seen by the writer.

The main vein, exposed in the creek, is usually from 5 to 9 inches wide. Branch-fractures up to 6 inches wide contain little sulphide mineralization. The writer took the two following samples from the main vein exposed in the creek.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
(1) About 100 feet from, and 40 feet higher than, upper adit-portal. 7 inches wide, quartz with much sulphide mineralization.	3.50	5.6
(2) 3 feet from No. 1. 8 inches wide, quartz and carbonate, not much sulphide mineralization.	0.76	0.4

In the upper adit vein-matter widens from 4 inches at the portal to 14 inches at 15 feet from the portal, and from a width of 14 inches at 20 feet pinches out within 2 feet. This lens consists of quartz well-mineralized with sulphides. The fracture has a maximum width of 23 inches where, at one side of the quartz lens, there is gouge 9 inches wide containing some quartz and sulphides. In the next few feet banded vein-matter, containing less sulphide mineralization, widens to 8 inches then narrows to 4 inches. Between 35 feet and 105 feet from the portal, banded vein-matter, containing comparatively little sulphide mineralization, is from 4 to 6 inches wide. Thence to 130 feet the vein-filling is 5 1/2 to 8 inches wide and contains more sulphides. At 137 feet the vein-matter has widened to 20 inches, it is white and crumbly and contains very little sulphide mineralization. At 145 feet from the portal the vein-matter is 14 inches wide and is much more heavily mineralized with sulphides.

On the north-western side of the drift, 145 feet from the portal, a branch-fracture strikes north 70 degrees west and dips steeply north-eastward; it converges with the vein 155 feet from the portal. Quartz, up to 2 1/2 inches wide, in the branch-vein contains a little pyrite. In the main fracture vein-matter, 14 inches wide 145 feet from the portal, narrows to 10 inches at 155 feet, and thence to 205 feet is 5 to 9 inches wide. It consists of quartz containing a fair percentage of sulphides. There is gouge 1/2 an inch to an inch wide along each wall. The vein-matter widens to 10 inches 212 feet from the portal. From this point for about 15 feet north-easterly the vein has been stoped to a height of 20 feet above the floor of the adit. Vein matter exposed in the ends and the roof of the stope is 8 to 14 inches wide. From the stope to 260 feet from the portal, the vein, fairly well mineralized with sulphides, is 6 to 12 inches in width.

From a width of 9 1/2 inches, 260 feet from the portal, the vein widens to 20 inches at 262 feet, and 27 inches at 270 feet, thence it narrows to 24 inches at 285 feet, and to 1 or 2 inches of gouge with a little quartz at 291 feet from the portal. This lens consists largely of quartz with but little sulphide mineralization. It is crumbly at the widest point. At 262 feet there is well-crystallized calcite at the north-western side of the lens. Between 262 feet and 291 feet from the portal the strike of the vein is approximately north-east. This is the section previously mentioned, in which there is dyke-rock along the north-western wall of the drift as well as along the south-western wall of the vein. The north-western wall of the vein is a narrow horse of quartz-diorite which pinches out where the dyke to the north-west converges with the dyke at the other wall. In the remaining section to the end of the drift, about 340 feet from the portal, the vein strikes about north 60 degrees west. It contains 4 or 5 inches of quartz with a fair percentage of sulphides.

The writer took the following samples from the vein in the upper adit.

Distance from portal feet	Width Inches	Description	Assay	
			Gold oz. per ton	Silver oz. per ton
80	6	Ribboned quartz with 1 1/2 inches gouge, not much sulphide.	0.10	Trace
115	6 1/2	Ribboned vein, not much sulphide.	0.30	0.1
165	5 1/2	Ribboned vein, not much sulphide, (excludes 2 inches unmineralized calcite at south-eastern wall).	0.20	Nil
185	9	Well-mineralized quartz.	1.04	1.0
208	8	" " "	4.24	5.2
250	11 1/2	Much sulphide mineralization in two streaks, 1 inch and 2 inches wide.	1.18	0.9
270	27	Crumbly quartz with a little sulphide mineralization.	Trace	Nil

From a rough survey it appeared that the portal of the lower adit is about 210 feet south 70 degrees west from, and 100 feet lower than, the upper adit-portal. The lower adit and three cuts between the adits expose fracturing striking from 60 degrees to 70 degrees east of north and dipping steeply north-westward. No dyke-rock was exposed. The fracturing is in quartz-diorite and contains rather rusty, banded quartz, 2 to 6 inches wide. There are probably 2 fractures and it is possible that they are branches from the main fracture, which may be covered by overburden south of these workings.

CASINO GROUP. (No.11 - Fig.1)

The claims Casino Nos. 1, 2, 3 and 4 were recorded in December 1938 and are understood to be owned by a syndicate or partnership consisting of A. Bird, J. Crossan, H. Gordon, A. Morod, V. Murphy, B. Smith and P. Williams. The partnership has other claims near and adjoining the Casino group. The claims are on the north-westerly slopes of Big Interior Mountain, an extremely rugged section. The slopes of the mountain are steep, often precipitous, and are cut by narrow steep-walled draws. A temporary camp was situated on the south-eastern side of Bedwell River at about 1,500 feet elevation. This point is about 13 1/2 miles by road and pack-trail from the head of Bedwell Sound. Approximately 1 mile easterly by trail a new camp, at about 2,750 feet elevation, was being built in September 1939. Barry Smith, one of the partners, was in charge of work at the property. Pioneer Gold Mines of B. C., Limited, and associated interests were financing and directing the work.

The rock exposed consists of quartz-diorite cut by many dykes. Much of the quartz-diorite is porphyritic. Discoveries of fracturing or shearing in which vein-mineralization occurs had been made at several points when the property was examined. Surface work on such occurrences had been done in four sections ranging from 3,200 feet to 4,750 feet in elevation and separated by considerable distances.

At approximately 3,200 feet elevation, about a quarter of a mile by trail in an easterly direction from the new camp, surface cuts and stripping have been made across a steep narrow draw and extending north-westerly along the north-eastern side of it. On the north-eastern side of the draw, cuts expose a vein, from 4 to 8 or 10 inches wide, which strikes about north 30 degrees west and dips north-eastward. Crossing the draw, for 20 feet from the north-eastern side, bedrock is not exposed. From this point for about 35 feet south-westerly to the other side of the draw, bed-rock has been exposed by removing from 3 to 10 feet of overburden. Here the vein is in

a roll which pitches northward at about 15 degrees. The thickness swells to about 30 inches near the north-eastern end of this stripping then diminishes to 16 inches 28 feet from the north-eastern end, thence to the south-western end of the stripping the hanging-wall and part of the vein have been removed by erosion. At the south-western end of the stripping the foot-wall strikes north 40 degrees east and dips about 35 degrees south-eastward.

For 3 to 5 inches from the foot-wall the vein consists of quartz and sulphides. This is overlain by a horse of wall-rock altered and cut by veinlets of quartz and sulphides. This in turn is overlain by partly-decomposed material containing quartz and some unaltered sulphides. At the thickest point the following samples were taken giving a section of 30 inches normal to the foot-wall.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
Width 3 1/2 inches, friable vein-matter, consisting of quartz and sulphides at foot-wall.	3.24	2.0
Width 14 inches, horse containing veinlets with sulphides.	0.50	Trace
Width 12 1/2 inches, decomposed upper layer, some quartz and sulphides.	0.60	Trace

As the size of the vein diminishes going south-westerly, the foot-wall-layer of quartz and sulphides maintains its thickness, but the overlying layer becomes thinner. The quartz at the foot-wall is loosely crystallized and is rudely banded with coarsely-crystalline pyrite and with sphalerite. The sphalerite is coated with covellite doubtless derived from the alteration of chalcopyrite which is present in small quantity. In general the vein-matter is partly decomposed and is very friable.

Approximately 150 feet south-westerly from this stripping there is a wide trench which extends to the south-west up the slope for about 35 feet. Overburden is deep and bedrock was not exposed at the north-eastern end of the trench. About 5 feet from the north-eastern end, at 3,265 feet eleva-

tion, 1 inch of rusty vein-matter was exposed. In 10 feet it widens to about 8 inches of quartz which splits and a few feet farther 6 inches of quartz at the foot-wall is separated by a 3-foot horse from quartz 4 to 6 inches thick, at the hanging-wall. Very little sulphide mineralization was seen. The foot-wall strikes north 35 degrees west and dips 35 to 40 degrees north-eastward. A cut 45 feet farther south-westerly, at approximately 3,310 feet elevation, exposes 8 inches of vein-matter which is quite rusty for 3 inches from the foot-wall. The bedrock in this section is buried below overburden 4 to 6 feet deep in which there are large boulders.

About a third of a mile southerly from these exposures a cut exposes a 4-inch quartz vein, and just south of this cut, on a westerly-facing bluff at the head of a draw, a narrow shear-zone is exposed. This zone is marked by rusty stain 10 to 30 inches wide extending for about 100 feet between 3,800 and 3,875 feet approximate elevations. The principal break is a narrow fissure containing gouge, some pyrite, sphalerite, and a little galena. It strikes about due east and dips about 35 degrees northward.

About 1,000 feet south-westerly by rough trail from this exposure there is mineralization on the north-eastern side of a draw which runs west of north. The draw crosses the general slope of the mountain-side obliquely, and on the south-western side is separated from the lower slopes by a low ridge. The north-eastern side of the draw rises in low cliffs to join the steep upper slopes of the mountain. Exposures continue at intervals for about 400 feet southerly along the steep north-eastern side of the draw between 4,150 and 4,250 feet, approximate elevations. Between sections where the mineralization is covered with talus the steep wall of the draw is very rusty over a vertical range from 3 or 4 feet to 10 feet. Shears and branching fractures cut the quartz-diorite and in the southern half of the exposure follow and cut through andesitic dyke-rock. The major shearing appears to strike west of north and to dip 35 degrees to 55 degrees north-eastward. Sulphides are developed with quartz in the fissures and to some extent are disseminated in the walls. Branching irregular masses of quartz occur in some of the fissures and some of these are heavily mineralized with pyrite, sphalerite and chalcopyrite. This type of mineralization is quite similar to that observed at the deposit at 3,200 feet elevation, mentioned earlier in this report. It consists of a loose aggregate of quartz crystals some of which are an inch or so in length. Sphalerite and well-crystallized pyrite occur with the quartz. Chalcopyrite is recognizable by the unaided eye and microscopically is also

seen intimately associated with the sphalerite. The sphalerite in these outcrops is also coated with covellite. Microscopic study of polished sections of this material showed veinlets of gangue with sphalerite and chalcopyrite filling the fractures in the quartz and pyrite. Sphalerite and chalcopyrite were also found as small irregular rounded masses replacing pyrite. Gold was found in the fractures; at contacts between pyrite and gangue, and pyrite and sphalerite; and as tiny grains in the pyrite. Two samples were taken from mineralization of this type in the north-western half of the exposure.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
Quartz lens 10 inches wide, with much pyrite and sphalerite.	4.06	Trace
Branch-vein 5 inches wide, lying 8 feet to north, containing less sulphide mineralization.	1.04	0.2

This type of mineralization is exposed locally only, in comparatively small lenses or short veins. Quartz with pyrite and some chalcopyrite, but little or no sphalerite, occurs in similar bodies in the exposure. The deposit had not been opened up and accordingly the exposures are of weathered material. Quartz and sulphide mineralization appear to form a small part of the whole.

Several hundred feet farther south-easterly, rusty shearing is exposed on steep bluffs from 4,685 feet to 4,750 feet approximate elevations. This shearing strikes from 70 degrees east of north to about due east and dips from 35 degrees to 50 degrees northward. Lenses of quartz, with pyrite, arsenopyrite, chalcopyrite and some sphalerite, are developed in the sheared quartz-diorite. The rusty sheared rock, from a few inches to about 3 feet thick, is exposed in three sections in a distance of about 175 feet. Two samples were taken from better mineralized exposures.

Description	Assay	
	Gold oz. per ton	Silver oz. per ton
5 inches consisting of 3 inches quartz and 2 inches silicified sheared quartz-diorite, impregnated with sulphides.	Trace	0.2
10-inch lens of quartz with sulphides.	0.08	Trace

TROPHY GROUP (No.14 - Fig.1)

The six claims Trophy Nos. 1 to 6, situated on the North Fork of Ursus Creek, were recorded in June and July 1939. The registered owners are James M. McKay and W. L. D. Davis. The claims cover a discovery on a tributary which flows north-westerly to the North Fork. When the writer visited this part of the area there were practically no trails but some routes for travel had been blazed roughly. Since that time a trail has been cut out, from a crossing of the Bedwell River above Penny Creek to Ursus Creek, and along the northern side of Ursus Creek to the North Fork, a total distance of about 6 miles. The elevation at the forks is about 300 feet. From this point a rough trail led to the site of a tent-camp on the south-eastern side of the North Fork, at approximately 1,500 feet elevation, about 2 miles from the forks. From the tent-camp a trail had been brushed out for a little more than a mile easterly along the southern side of the valley to a tributary creek. The tributary was followed south-easterly to the head of a canyon where the Trophy vein is exposed at approximately 3,000 feet elevation. It is reported that since the examination the trail from the forks has been improved, that several cabins have been built, and that development work has been done on the vein.

This part of the area is underlain by granitic rock of the Coast Range intrusives. The rock is dominantly quartz-diorite of medium to coarse texture but locally there are marked changes in texture. On the divide between the forks, a considerable mass of fine-grained quartz-diorite outcrops, and in the canyon a short distance below the Trophy vein a darker fine-grained granitic rock, impregnated with sulphides, is exposed. The rocks near the head of the canyon are very much altered hydrothermally; they consist principally of the usual quartz-diorite but include some light fine-grained dykes too altered for determination. At some points in this part of the area small remnants of volcanic rock are exposed.

The canyon, 30 or 40 feet wide and about 75 feet deep near the head, trends west of north. It cuts into a grassy basin which to the south and south-east rises to the divide between Ursus Creek and the North Fork. A small stream from the basin enters the canyon by a narrow chute, following a shear, in the precipitous wall at the head of the canyon. The shear, which strikes north 35 degrees west and dips 65 to 70 degrees north-eastward, contains some quartz. A sample taken across 14 inches, the width of the shear, assayed: nil in gold and silver.

The Trophy vein, striking north 70 degrees east and dipping 80 degrees south-eastward, crosses the canyon a few feet northerly from the chute. On the eastern side of the canyon the vein is exposed for about 40 feet above the floor. On the opposite side 25 feet westerly from the foot of this exposure the vein is again exposed, and westerly from this point is continuously exposed for a horizontal distance of about 75 feet. The end of this exposure is about 50 feet above the floor of the canyon. Westerly from this point at distances of approximately 10, 45 and 50 feet, where the side of the canyon is less precipitous, the vein is exposed in shallow cuts. The vein was thus indicated for a length of about 175 feet through a vertical range of about 65 feet. The width of vein-matter, seen by the writer, ranged from 6 to 11 inches in the highest exposures to about 16 inches near the bottom of the canyon. It is reported that since the property was examined an adit has been driven southerly, from the western side of the canyon, to crosscut the vein, and that some drifting has been done on the vein.

There is some gouge along the walls of the vein; the rest of the vein-filling consists principally of banded quartz containing a small percentage of sulphides irregularly distributed. Parts of the vein consist of white quartz which is not banded. Thin partings of grey gouge between plates of quartz from a 1/4-inch to 2 or 3 inches thick, give the vein its banded appearance. The partings are essentially parallel to the walls and contain a good deal of sericite. Some of the partings have been silicified and consolidated with the quartz. Sulphide minerals in fine grains are found along the partings and small aggregates of coarser sulphides occur through the quartz. The most abundant sulphide is pyrite; galena, sphalerite and chalcopyrite are also present. Free gold in small angular grains is frequently recognized in the white quartz. Polished sections from this vein, studied microscopically, indicated that the sulphides occur in fractures in the quartz. Intergrowths of sphalerite and chalcopyrite were observed in fractures cutting pyrite grains and at

the margins of pyrite grains. Galena and chalcopyrite were observed in fractures which cut pyrite and sphalerite. Gold was found with galena in pyrite, at the margins of pyrite and of galena grains, and in the gangue away from sulphides.

The writer selected 3 or 4 pounds of white quartz, in pieces averaging more than an ounce in weight, essentially free from rust or pyrite. In selecting this material two pieces which contained visible gold were rejected. The sample assayed: Gold, 0.02 oz. per ton; silver, trace. A sample of selected sulphide-bearing material assayed: Gold, 2.70 oz. per ton; silver, 0.7 oz. per ton. The writer took three samples across the width of the vein, assays concerning which are as follow:

Width Inches	Description	Assay	
		Gold oz. per ton	Silver oz. per ton
9 1/2	From eastern side of canyon, about 30 feet above the floor. Banded vein, little sulphide mineralization,	0.30	Trace
14	12 feet easterly from bottom of exposure, eastern side of canyon. Banded vein, little sulphide mineralization.	0.08	Trace
16	On western side of canyon, 5 feet westerly from bottom of exposure. Banded vein, some sulphide mineralization.	0.58	0.6

Sulphide mineralization in the vein was much more abundant on the western side of the canyon than on the eastern side and reliable independent sampling indicated that values on the western side of the canyon were much better than on the eastern side. The projection of the shear exposed at the head of the canyon would intersect the vein in the floor of the canyon. This point was covered with debris and could not be examined. It is possible that the shear has a bearing on the distribution of values in the vein. However, it should be observed that free gold was found in quartz from the exposure on the eastern side of the canyon.

THUNDERBIRD GROUP. (No.15 - Fig.1)

Ownership of claims Thunderbird Nos. 1 to 8, recorded in May and June 1939, is covered by a partnership agreement between B. H. Symns, J. W. Harvey, H. F. Martin, G. A. Williams and D. V. Evans. Other claims in the same vicinity were also located by the partners. The claims are situated south of the main fork of Ursus Creek. In going to the property the writer followed a blazed route from the crossing of the Bedwell River along the northern side of Ursus Creek for about 4 1/2 miles. The route then crossed to the southern side on a log jam and continued on that side past the forks to the property, a total distance estimated at 8 miles. A well-located trail would probably be shorter than the rather irregular route followed. In the autumn of 1939 a trail up Ursus Creek on the northern side was cut out as far as the forks.

The southern side of the valley rises steeply from Ursus Creek. Down this steep slope, from the large basin in which it rises, Thunder Creek pours in a series of cascades. From the basin the course of the creek is northerly to the junction with a westerly-flowing branch, from which junction Thunder Creek flows north-westerly less than a quarter of a mile to its confluence with Ursus Creek. West of Thunder Creek, at about 800 feet elevation a lean-to camp has been built on the steep slope below the basin. Also on the western side of the creek there are several surface cuts and strippings, between 735 feet and 825 feet elevation, within a few hundred feet north-easterly from the camp. About 1,000 feet easterly from the camp, at approximately 700 feet elevation, at the northern edge of the branch creek, there is another surface cut. The workings are in quartz-diorite, within a few hundred feet of the contact with volcanic rocks which lie to the south of the intrusive. The contact probably runs north of west, crossing Ursus Creek near the forks.

On this property quartz-diorite is cut by two or more zones of parallel slips or joints along which there has been some shearing. They strike within 15 degrees or so of due east and stand vertically or dip steeply either northward or southward. At approximately 800 feet elevation, not far north of the contact, closely-spaced slips in a zone about 20 feet wide cross Thunder Creek. The quartz-diorite wall-rock is very much altered. The cut on the westerly flowing tributary is about 600 feet north-easterly from this point at about 700 feet elevation. Here the quartz-diorite is cut by slips standing almost vertically and striking approximately due east. There has been shearing along the slips and the rock between them is cut by secondary joints making various

angles with the shearing. The quartz-diorite is altered and contains numerous quartz stringers and is impregnated with fine-grained pyrite. A width of 12 feet of such material is exposed. In the creek within 200 feet westerly from the cut there are exposures of similar material. A sample representative of the pyrite-impregnated wall-rock, as free as possible from rust, was selected from the cut. It assayed nil in gold and silver. Quartz 1 1/2 inches wide was found just south of the cut and was probably in place. A sample of this material containing pyrite and some chalcopyrite assayed: Gold, 0.10 oz. per ton; silver, trace; copper, 0.1 per cent.

Near the camp, surface workings expose shears which strike north-westerly and dip almost vertically. Quartz up to 12 inches wide, developed in the sheared and altered quartz-diorite, contains some pyrite and occasionally a little galena. On a small bench a little higher than the camp, shallow stripping and trenching expose a shear for a length of about 150 feet. The shear has also been crosscut by a rock-cut about 6 feet deep, driven 25 feet south-westerly. It contains quartz from 2 to 8 inches wide. Sulphide mineralization is very sparingly developed. A sample taken by the writer in the cut, across quartz 8 inches wide, assayed: Gold, 0.03 oz. per ton; silver, trace. The wall-rock beside the quartz is mineralized with pyrite, a sample of this material assayed nil in gold and silver. From a point at 775 feet elevation, 70 feet due north from the vein in the rock-cut, a similar shear has been exposed by stripping for 70 feet north-westerly. The rock is sheared for a width of 10 to 18 inches in which there are narrow irregular veinlets of quartz. Some of the quartz contains pyrite and a little galena was seen. The quartz and wall-rock are stained with black manganese oxide. A sample across 12 1/2 inches, consisting largely of quartz, taken near the south-eastern end of the stripping assayed: Gold, 0.02 oz. per ton; silver, trace. About 100 feet west of north from this point, at 735 feet elevation, shearing of the same general attitude is exposed for a few feet by a surface cut. Here quartz 4 inches wide contained a little galena. A sample of this material assayed nil in gold and silver.